CHAPTER 5
AFFECTED ENVIRONMENT – YAKIMA TRAINING CENTER

This chapter describes the affected environment for YTC. The affected environment is the portion of the existing environment that could be affected by the project. The affected environment varies for each resource. Both the nature of the resource and components of the alternatives dictate this variation. The following sections concentrate on providing only the specific environmental information necessary to assess the potential effects of the alternatives analyzed in **Chapter 6**.

5.1 SOIL EROSION

Soils at YTC are highly varied with respect to particle size, depth, slope, thickness, permeability, and other factors. Because a large portion of YTC soils is shallow light silt loams characteristic of arid to semiarid climates, many soils at the installation are fragile and easily eroded (Army 2002b). A recently completed soil survey at YTC (Gentry 2006) provides information about local soil resources. Introduction of fine sediment into streams that feed the Yakima and Columbia Rivers is a major water quality concern at YTC and was the focus of a recent study (Wigmosta et al. 2007). Management activities undertaken by the YTC Environment and Natural Resource Division (ENRD) and management and monitoring strategies implemented by the ITAM program are outlined in YTC's CNRMP/INRMP.

5.1.1 Geologic and Physiographic Setting

YTC lies within the Columbia Plateau physiographic province. YTC topography is dominated by east-west trending anticlinal and synclinal ridges and north-south trending drainages that dissect the ridges. Numerous drainages parallel the ridges and contribute water and sediment to the Columbia River on the east and the Yakima River on the west. Elevations at YTC range from approximately 500 feet (152 m) above MSL at Priest Rapids Dam on the Columbia River to 4,216 feet (1,285 m) at the top of Cairn Hope Peak.

The majority of folding and uplift that produced the ridges at YTC occurred approximately 9 million to 1.8 million years ago. This disturbance occurred after the deposition of extensive flood basalts during the Miocene period (Army 2002b). Although uplift has slowed, tilted fan piedmonts indicate continued faulting.

Although Pleistocene glaciers did not reach YTC, humid conditions associated with the glaciations resulted in increased deposition of loess (windblown silt) in the area. Because of prevailing southwesterly winds, up to 10 feet (3 m) of loess was deposited on north-facing slopes, but only a few inches on south-facing slopes (Gentry 2006). Also during the Pleistocene, a series of approximately 40 catastrophic floods inundated the area. The floods resulted from the repeated release of up to 500 cubic meters (m^3) of water stored eastward of ice dams on the Clark Fork River near the Idaho-Montana border, as hydrostatic pressure periodically lifted the ice (Alt 2000). Downstream ponding of the floodwaters at Wallula Gap caused the deposition of granite erratics (up to 5 meters in diameter), silts, sands, and gravel (Army 2002b).

5.1.2 Soils

Soils at YTC have formed from a variety of parent materials and at several landscape positions. Major soil associations fall into four groups, depending on the surface material from which they have formed and local topography:

- Soils that have formed in glacial outwash, loess, alluvium, and lacustrine sediments; on terraces, terrace escarpments, and benches in areas of channeled scabland;
- Soils that formed in loess, slope alluvium, and alluvium; on alluvial fans and terraces;
- Soils that formed in residuum and colluvium derived from basalt and in loess; on hillslopes, ridgetops, and benches;
- Soils that formed in loess, slope alluvium, and residuum and colluvium derived from basalt; on plateaus, benches, ridgetops, and hillsides (Gentry 2006).

Shallow soils (Lithosols) are common (approximately 40 percent of YTC acreage) and are generally found on south-facing slopes and windswept ridges (Army 2002b; U.S. Department of Agriculture [USDA] 2009). Lithosols commonly contain high percentages of cobbles and boulders. Because of their shallow nature and rock content, they have limited water-holding capacity and may be extremely saturated for about 6 to 8 weeks every year.

Deep soils consist of a variety of soil orders – Mollisols being the most dominant, followed by less extensive Aridisols, Entisols, and Alfisols. Deep soils are often loamy or cobbly, generally are more productive, and have higher water-holding capacities than Lithosols. Although deep soils typically become saturated because of snowmelt, they also dry quickly as water percolates through the soil profile. Silt loams and very cobbly loams make up about 70 percent of YTC soils (Army 2002b).

Most soils at YTC are characteristic of arid climates and mesic temperature regimes (Gentry 2006). Soil surveys at YTC have identified more than 200 soil units. Each of these units has been rated in terms of suitability for various military operations.

5.1.2.1 Suitability of Soils for Military Operations

Soils present at YTC are not all equally suitable for the various operations that the Army conducts. **Table 5–1** shows the suitability ratings of aggregated soils at YTC for supporting the various types of operations, such as the ease of developing bivouac areas, ease of digging, resistance to sloughing, and position and weapon readiness. Limiting factors for each activity may include depth to and hardness of bedrock or a cemented pan, content of large stones, depth to seasonal water table, slope, and soil texture. Soil properties that influence trafficability and promote the growth of vegetation in bivouac areas were also considered (USDA 2009). Factors limiting feasibility of soil use for helicopter landing zones include a dusty surface layer, steep slopes, large surface stones, and frequent flooding or ponding. Ratings summarized in **Table 5–1** and **Table 5–2** were developed by the USDA and are based on empirical soil properties and intended use. These ratings are conservative estimates for use during operations planning. These ratings are intended for planning guidance and do not represent the results of monitoring activities at YTC.

Table 5–2 summarizes trafficability of YTC lands for vehicular operations. Trafficability ratings for soils at YTC have been developed through the application of results derived from experimental observations at numerous military installations on various soil types under a range of soil saturation conditions and are used as guidelines for assessing the capability of soils to support military vehicles. These estimates depend in part on topography, soil, and local climate and are based on procedures and criteria described in FM 5–430–00–1, Chapter 7 (USDA 2009). Trafficability ratings for each

soil unit at YTC are based on soil properties (e.g., viscosity, large surface stones, and slope) that influence vehicle-soil interactions, including compaction, disturbance, and traction. In general, soils with good trafficability should absorb rainfall readily, should remain firm under repeated traffic, and should not be dusty when dry. The estimates of trafficability are for Type 5 vehicles (most all-wheel-drive trucks, a great number of trailed vehicles, and heavy tanks). The 50-pass trafficability ratings are based on repeated use of the same track.

Table 5–1 Suitability Ratings for Selected Military Operations at YTC

Operation/Rating[1]	Portion of Areal Extent at YTC (percent)
Bivouac Areas	
Not Limited	25.08
Somewhat Limited	13.53
Very Limited	60.64
Not Rated	0.75
Excavations for Crew-Served Weapon Fighting Position	
Not Limited	18.46
Somewhat Limited	9.41
Very Limited	69.38
Not Rated	2.75
Excavations for Individual Fighting Position	
Not Limited	43.35
Somewhat Limited	42.30
Very Limited	11.60
Not Rated	2.75
Excavations for Vehicle Fighting Position	
Not Limited	18.45
Somewhat Limited	8.76
Very Limited	70.04
Not Rated	2.75
Helicopter Landing Zones	
Not Limited	<0.01
Somewhat Limited	4.90
Very Limited	93.70
Not Rated	1.40

Note:

1. Not Limited = Soil features very preferable. Somewhat Limited = Soil features moderately favorable; limitations can be overcome or minimized by special planning, design, or installation; fair performance and moderate maintenance can be expected. Very Limited = One or more soil features unfavorable; limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures; poor performance and high maintenance can be expected.
2. Soil maintenance includes: 1) filling in any ruts so that they do not become conduits for runoff 2) adding a binder to the soil to minimize dust propagation 3) surface preparation for revegetation (if needed). Low maintenance soils will not develop ruts, will not be major sources of dust, will not be major sources of sediment, and will be easy to revegetate if necessary. High maintenance soils will require extensive maintenance activities to minimize degradation and maintain productivity (Dobos 2009). Ratings are for the extent of the USDA Soil Survey of Yakima Training Center, Parts of Kittitas and Yakima Counties, Washington (Gentry 2006).

Source: USDA 2009

Table 5–2 Vehicle Trafficability – Type 5 Vehicles – of YTC Soils

	Wet Season[3] - 1 Pass		Wet Season[3] - 50 Passes		Dry Season - 50 Passes	
Rating[1]	Areal Extent (acres)	Portion of Total (percent)	Areal Extent (acres)	Portion of Total (percent)	Areal Extent (acres)	Portion of Total (percent)
Excellent	6,327.1	1.9	6,327.1	1.9	186,158.1	55.2
Good	269,627.4	80.0	196,965.6	58.4	91,079.2	27.0
Fair	32,926.5	9.8	105,588.3	31.3	31,643.7	9.4
Poor	19,511.3	5.8	19,511.3	5.8	19,511.3	5.8
Null or Not Rated	8,850.6	2.6	8,850.6	2.6	8,850.6	2.6
Total[2]	337,242.9	100.0	337,242.9	100.0	337,242.9	100.0

Note:

1. Rating: Excellent = No limiting features; very low maintenance can be expected. Good = Soils may have limiting characteristics but are favorable for use; good operational performance and low maintenance can be expected. Fair = Soils have limiting characteristics and are moderately favorable for use; fair performance, moderate maintenance, and soil degradation can be expected. Poor = Soils have characteristics that severely limit trafficability and one or more features that are unfavorable for use; limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures; poor performance, high maintenance, and soil degradation can be expected.
2. Soil maintenance includes: 1) filling in any ruts so that they do not become conduits for runoff; 2) adding a binder to the soil to minimize dust propagation; and 3) surface preparation for revegetation (if needed). Low maintenance soils will not develop ruts, will not be major sources of dust, will not be major sources of sediment, and will be easy to revegetate if necessary. High maintenance soils will require extensive maintenance activities to minimize degradation and maintain productivity (Dobos 2009).
3. Total acreage represents the full extent of the USDA Soil Survey of Yakima Training Center, Parts of Kittitas and Yakima Counties, Washington (Gentry 2006) and includes areas that may not typically be considered part of YTC (e.g., portions of the Columbia River between the riverbank and the Grant County border).

Source: USDA 2009

5.1.2.2 Erosion Status

Most soils at YTC are highly susceptible to erosion because of physical properties, steep slopes, and limited vegetative cover (Army 2002b). Most erosion and runoff at YTC result from short-duration, high-intensity rain-on-snow events, commonly in areas of frozen or partially frozen soil. Frozen soils may be extremely resistant to erosion, but the erodibility of thawing soils is often greater. Summer thunderstorms are also a significant source of runoff (Wigmosta et al. 2007). YTC sediment yield has been quantified by modeling subbasins that averaged 106 acres (42.9 ha) in area. Results of this study found that yearly sediment yields across YTC under current conditions range from nearly zero to 1.64 tons per acre (4.05 tons/ha). Subbasins were grouped into five sediment yield classes, the boundaries (Class Limits) of which were defined using a five-class Jenks natural breaks algorithm in ArcExplorer (**Table 5–3**; Wigmosta et al. 2007). Often, unimproved roads and firebreaks contribute disproportionate amounts of sediment load within a given watershed (i.e., they yield more sediment per unit area) than the surrounding rangeland (Wigmosta et al. 2007). Other disturbances at YTC influencing soil erosion include excavations, intensive off-road vehicle travel, weapons fire, bivouacs, and wildland fire (Army 2002b).

Table 5–3 Yearly Sediment Yield at YTC

Sediment Class	Class Limits (tons/acre/yr)	Portion of YTC Areal Extent (percent)	Portion of YTC Sediment Yield (percent)
1 (Low Yield)	0.00-0.158	25.2	9.3
2	0.158-0.312	32.6	26.6
3	0.312-0.502	28.7	34.9
4	0.502-0.870	11.4	22.5
5 (High Yield)	0.870-1.639	2	6.6

Source: Wigmosta et al. 2007

5.1.2.3 Erosion Management

YTC (Army 2002b) has implemented numerous monitoring and mitigation strategies that aim to maintain soils in a means that supports other natural resources, such as vegetation, water quality, wildlife, and cultural resources. Key strategies include:

- stabilizing banks along the Columbia River (YTC ENRD 2007b);
- minimizing soil disturbances through coordination with Training Units;
- revegetating;
- upgrading heavily used unimproved roads and bivouac areas;
- performing road maintenance after large maneuver events;
- installing weirs and check dams to promote sediment deposition;
- rotating training areas to provide for soil and vegetation recovery;
- monitoring water quality;
- closing steep roads, those adjacent to streams, and those that are not maintained to reduce soil loss; and
- monitoring wet soils and limiting maneuver training when soils are saturated (Army 2002b).

Data collected during monitoring are used to plan, implement, and measure the effectiveness of erosion control measures at YTC in accordance with the goals of the CNRMP/INRMP (Durkee 2007). Previous resource management plans have identified soil management thresholds with the objectives of 1) minimizing soil loss above background levels and 2) having soils with biologic and physical functions that are supportive of other natural resource elements (Army 2002b). The YTC ENRD has investigated a soil erosion model that is appropriate for YTC climate and soils. This model has produced a Spreadsheet Implemented Multi-objective Decision Support System (SIMDSS) that is capable of, but has not yet been implemented towards, evaluating and scoring individual proposed and alternative management practices at YTC (Wigmosta et al. 2007).

5.2 WATER RESOURCES

The affected environment section for water resources lays out the foundation for addressing the issues identified during public scoping. These issues include the effects of Army Growth and Force Structure Realignment on surface water resources and the effects of construction and demolition activities and long-term operations on surface and groundwater quality, including drinking water sources, and hydrology.

The ROI for water resources includes portions of several jurisdictional units that were designated by Washington's natural resource agencies (Washington Department of Ecology and WDNR). YTC lies within three WAUs whose boundaries coincide with WRIAs, as defined by the State of Washington natural resource agencies. These include Lower Yakima (WRIA 37), Upper Yakima (WRIA 39), and Alkali/Squilchuck (WRIA 40). WRIA and watershed boundaries are illustrated on **Figure 5–1**.

5.2.1 Surface Water

Surface water resources in the ROI include rivers, streams, lakes, and wetlands. The following sections describe the occurrence, quantity, and quality of water present in these resources.

5.2.1.1 Surface Water Occurrence and Quantity

The main surface water features near the ROI include the Columbia River to the east and the Yakima River to the west. Surface water resources at YTC include streams, seeps, springs, and artificial ponds. Sixteen man-made sediment retention ponds are maintained for erosion control and monitoring. Four additional ponds include Greely Pond (for wildlife), Kiddie Pond (for recreation), Taylor Pond (for firefighting), and Foster Pond (for firefighting and training support) (Army 2002b).

Major streams discharging into the Columbia River include Alkali, Hanson, and Johnson Creeks, which are at least partially perennial; and Sourdough, Middle, and Corral Canyon Creeks, which are intermittent. Selah and Lmuma Creeks, which are perennial in their lower reaches, and intermittent Cold Creek discharge into the Yakima River (**Figure 5–1**). The remaining drainages on YTC are ephemeral or intermittent flowing for a short time in the spring or immediately following a large storm event.

Hydrologic conditions vary annually depending on seasonal snowpack and runoff characteristics. Rain falling on snow or frozen ground may result in flash runoff events with minimum water retention. Gradual melting of snow creates more consistent spring flows and recharges shallow aquifers resulting in higher, more consistent summer base flows. Several years of drought conditions can cause perennial streams to become intermittent or ephemeral in certain reaches. When shallow aquifers are recharged temporarily, intermittent reaches or ephemeral reaches may return to a perennial condition (Army 2002b).

Data on stream flows near the ROI are available from USGS gaging stations on the Yakima and Columbia Rivers. The USGS station at Umtanum (12484500) is located near the upstream boundary of YTC, and a station at Union Gap (12500450) is located downstream of YTC (**Figure 5–1**). Flows in the Yakima River averaged 2,430 cfs (4.13 million L/minute) at the Umtanum station (period of record 1934 – 2007) and 3,545 cfs (6.02 million L/minute) at Union Gap station (period of record 1967–2008). Flows in the Yakima River vary throughout the year (USGS 2008).

River basins, such as the Yakima, that are regulated for irrigation and flood control purposes commonly exhibit a change from the natural flow. A substantial “shift” in the timing and volume of peak spring flows and summer flows occurs between the unregulated regime and the regulated conditions. As a result, current conditions have inverted and truncated the natural flow regime, producing river systems that are out of phase with their natural runoff regimes (Bureau of Reclamation 2008).

Peak runoff in the Yakima River occurs during snowmelt in April and May. Because of diversions, flow regulation in the headwaters, and dry summers, some reaches of the Yakima River have a low-flow period during late summer. Most tributaries of the Yakima River are dominated by irrigation returns and have their low-flow periods in the winter (Johnson 2007).

Natural flow from runoff gradually diminishes during the early irrigation season until most of the water in the rivers is managed as a controlled release from storage reservoirs, which can precisely regulate the flow regime and supply the specific amount of water needed for irrigation, hydropower, and instream flow demands (Coffin et al. 2006).

The major streamflow management point is the gaging station at the Yakima River near Parker (located downstream of YTC). About 45 percent of the water diverted for irrigation is eventually returned to the river system as surface water inflows and groundwater discharge, but at varying time lags. During the low-flow period, these return flows, on average, account for about 75 percent of the streamflow below the streamflow gaging station near Parker. Much of the surface water demand in the basin below Parker is met by these return flows and not by release of water from the reservoirs.

Ellensburg
Yakima River/Naneum Creek
Ginkgo State Park
Parke Creek
Johnson Creek
Yakima River
Squaw Creek
Alkali-Squilchuck
Hanson Creek
Alkali Canyon
enas Creek
Burbank Creek
Upper Yakima
Umtanum-Selah
KITTITAS COUNTY
YAKIMA COUNTY
Esquatzel Coulee
Alkali Canyon
Columbia River
Selah Airstrip
Selah Creek
Selah
Yakima
Cold Creek
Lower Yakima
Cold Creek
Union Gap
Yakima/Toppenish
90
82
823
24
243

Legend

- USGS Monitoring Station
- Interstate
- Federal Highway
- State Route
- Water Body
- Perennial Stream
- Intermittent Stream
- WAU Boundary
- WRIA Boundary
- Sensitive Environmental Area *
- Yakima Training Center Boundary
- Municipal Area
- County Boundary

* Sensitive Environmental Areas include Wetlands, Riparian Zones, Springs, and Major Streams

N W E S

50 25 0 50 100

Miles

U.S.ARMY

FORT LEWIS
Home of America's Corps

FORT LEWIS GTA EIS

Figure 5-1
Water Resources at
Yakima Training Center

ANALYSIS AREA: Yakima & Kittitas Counties, Washington	
Date: 7/14/2009	File: FortLewis\Yak_hydro.mxd
Prepared By: JG	Layout: Yak_hydro.pdf

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As a result of water use in the basin, the difference between mean annual unregulated (adjusted for regulation and without diversions or returns) and regulated streamflow in the basin is about 2,000 cfs (3.4 million L/minute), suggesting that some 1.4 million acre-feet of water, or about 17 percent of the precipitation in the basin, is consumptively used—principally by irrigated crops through evapotranspiration (Vaccaro and Olsen 2007).

Although the majority of the low flow period occurs in the winter, severe winter rain and snowmelt can cause flood conditions in the winter (Shapiro and Associates, Inc. 1987). Based on the 2008 FEMA/FIRM maps, some flooding potential exists on the Yakima River downstream from Selah Creek (Washington Department of Ecology 2008).

Flows in the Columbia River are regulated by a series of dams. Two of these dams are the Wanapum Dam and Priest Rapids Dam, both of which are adjacent to the eastern boundary of YTC (Shapiro and Associates, Inc. 1987). Flows in the Columbia River below Priest Rapids Dam (USGS gaging station 12472800) downstream from YTC averaged 118,790 cfs (202 million L/minute) between 1918 and 2007 (USGS 2008). Therefore, flooding is not an issue on the Columbia River (Washington Department of Ecology 2008). Based on the FEMA/FIRM maps, flooding is not an issue within the YTC boundaries (Washington Department of Ecology 2008).

The stormwater drainage system serving the cantonment area at YTC consists of three detention basins, several oil/water separators, and open ditches that convey the runoff to several industrial stormwater outfalls (McDonald 2009b). The drainage system discharges into an intermittent stream, which then enters the Yakima River downstream of Selah Creek. Because of the low hydraulic gradient of vegetated channels of the drainage systems and long distances to receiving waters, stormwater discharges do not affect the Yakima River (Army 2005c).

5.2.1.2 Surface Water Quality

The State of Washington Department of Ecology has not designated any of the streams in the YTC ROI as impaired (Washington Department of Ecology 2004). The lower reach of the Yakima River, however, is listed on the 303(d) list as impaired by pH, temperature, and pesticides. The sources of impairing pollutants are irrigated cropland, animal holding areas, and in-place (sediment) contamination. YTC has not been identified as a source of water quality impairment to receiving waters. Selah Ditch, west of YTC, has been listed as impaired by fecal coliform and temperature from unknown sources. The stream segment of Columbia River upstream of the YTC ROI has also been listed as water quality impaired due to temperature from unknown sources (Washington Department of Ecology 2004).

The primary water quality concern at YTC is introduction of fine sediment into streams with subsequent discharge to the Yakima and Columbia Rivers. Discharge of fine sediment is most likely following high, short-duration flow events, which typically involve rain falling on snow or frozen ground. Sources of fine sediment include degraded upland areas, improperly designed and located roads, degraded channels resulting from mass wasting, and natural erosion processes.

To date, conclusions based on analyzed data indicate that sediment loads from YTC contribute a small fraction of total sediment loads in the Columbia and Yakima systems. However, the effect of timing and extent of discharge is not known. High discharges of solids from YTC may occur over very short periods (36 to 48 hours). Peak sediment discharge is often associated with occurrences of rain-on-snow events over frozen ground. Runoff events can occur from November through February, with spring events usually occurring earlier at YTC than in the Cascade Mountains. Infrequent runoff events have been monitored, resulting in sporadic data that are difficult to interpret. Due to high

variability in dryland hydrology and weather, it is difficult to determine whether changes in water quality are because of management practices or natural processes associated with dryland hydrology (Army 2002b). As a part of Surface Water Quality Monitoring Protocol, YTC has installed remote water quality monitoring stations on Selah Creek, Middle Canyon, Sagebrush Canyon, and north fork of Lmuma Creek. However, no data have been collected to date because high flow events are lacking during the past few years or because the automated samplers were improperly installed or programmed (YTC ENRD 2004, 2006b, 2007c).

Discharges of sediment to the Yakima River are more critical than those to the Columbia River because the Yakima River basin has high sediment inputs from other existing sources, primarily runoff from agricultural lands, and, in particular, irrigation return flows. Most of the agricultural loading of suspended sediment occurs downstream from YTC, although some occurs in the Kittitas Valley and from tributaries west of YTC that drain similar terrain.

Solids loads from YTC appear to be small compared to loads carried by the Yakima River adjacent to YTC. The USGS monitors water quality in the Yakima River at both the Umtanum and Union Gap stations. Additionally, the Washington Department of Ecology monitors water quality in the Yakima River at Parker, which is 2.7 miles (4.3 km) downstream from the USGS station at Union Gap (**Figure 5–1**).

Umtanum Creek, Wenas Creek, the streams draining YTC, Naches River, and the Moxee Drain all drain into the Yakima River between Umtanum and Union Gap. Ahtanum Creek enters the river, and the New Reservation Canal leaves the river between Union Gap and Parker. All of these streams are sources of suspended solids to the Yakima River. The USGS also monitors water quality at Kiona station (12510500) located in the lower part of the Yakima River (**Figure 5–1**).

The suspended loads measurements at these monitoring stations were not sampled in all years, and the periods of record vary as well. However, between 1987 and 1990, water quality measurements were collected at all four locations. As previously discussed in the 1994 Stationing of Mechanized or Armored Combat Forces at Fort Lewis FEIS, the concentrations of suspended solids were typically higher at Union Gap than at Umtanum, usually higher but sometimes lower at Parker than at Union Gap, and typically higher at Kiona than at Parker (Army 1994).

In 1994 through 1995, the Washington State Department of Ecology conducted a TMDL evaluation, and in 1998, the EPA approved a Water Cleanup Plan designed to reduce suspended sediments and pesticides in the Yakima River. The more recent (2003) Washington Department of Ecology monitoring evaluated the suspended solids loads at the Kiona Station and concluded that the loads have been greatly reduced (by 50 to 70 percent) compared to previous decades (Coffin et al. 2006, Washington Department of Ecology 2008).

A restoration program exists at YTC to reduce and minimize discharge of sediment to both the Yakima and Columbia Rivers. The program includes management and rotation of training areas to allow vegetation to recover, active restoration by planting, construction of sediment trapping check dams at critical locations, and protection of critical riparian vegetation corridors by restricting use of those areas. The restoration program is consistent with the requirements for best management practices for compliance with the antidegradation policy of the State of Washington (WAC 173–20 1 A–070) for nonpoint sources of pollution, as required by Section 319 of the Clean Water Act (Army 1994, McDonald 2009b).

Within recent years, YTC has completed improvements in road network and structure, road closures and realignments, and channel crossings. Nearly 300 miles (480 km) of existing roads have been

resurfaced with crushed rock. Approximately 14 miles (23 km) of roads were re-routed away from stream channels and areas with a high potential for erosion. Approximately 14 miles (23 km) of deteriorated or poorly located roads were closed to vehicle traffic and rehabilitated. In addition, 390 stream channel crossings have been improved with culverts and fords. Along with these improvements, riparian and upland restoration programs contribute to minimizing the quantity of fine sediment reaching YTC streams and subsequently transported to the Columbia and Yakima Rivers (Army 2005c).

Suspended solids discharged from YTC add to effects of suspended solids discharged naturally and from agricultural sources, but the magnitude of contribution of suspended solids from YTC is very small compared to other sources. Other causes of water quality impairment (bacteria, pesticides, and temperature) are not significantly affected by activities at YTC. Nutrients may be affected as a secondary effect of soil erosion and sediment discharge.

5.2.2 Groundwater

5.2.2.1 Groundwater Occurrence

Groundwater in the ROI for YTC occurs within four principal aquifers: surficial sedimentary units (principally Ellensburg Formation), Saddle Mountains Basalt, Wanapum Basalt, and Grande Ronde Basalt (Army 1994). The four aquifers are not present everywhere across YTC; the occurrence and movement of groundwater at a given location depends upon rock type, geologic structure, and topography. Extensive folding of the sedimentary and basalt strata created a complex groundwater system with highly variable hydraulic properties, depths to water, and flow directions.

Groundwater is found in gravel layers within the surficial sedimentary formations, typically confined by overlying finer-grained materials. Within the sequences of basalt, groundwater is predominantly found within the weathered, more fractured contact zones and within sedimentary interflow zones. Reported subsurface depths of groundwater range from 20 feet in stream valleys to more than 200 feet at higher elevations. Groundwater springs occur where incised stream valleys intercept aquifers. Although precipitation is low within the ROI, approximately 200 springs are present on YTC, ranging from seasonal to perennial (Army 2005c).

Deeper aquifers are recharged mainly from areas west of the installation, whereas shallower aquifers are recharged primarily from precipitation falling at higher elevations on YTC. Water level elevation maps for aquifers in this area indicate regional groundwater flow from recharge areas in the center part of YTC toward the Yakima River on the west and south, and toward the Columbia River on the east. Locally, groundwater flow patterns are affected by topography and groundwater pumping (Army 1994).

5.2.2.2 Groundwater Quality

Groundwater at YTC is accessed for potable and non-potable uses. Quality can be evaluated for potable water because it is subject to periodic analysis. Aquifers in which drinking water wells are developed have shown no evidence of degradation (Bartz 2009).

In the past 30 years, two potable wells were found to be subject to contamination from surface waters. In one case, the well was decommissioned. In the second case, the well was repaired by re-casing and re-grouting. Subsequent monitoring has shown there is no contamination (Bartz 2009).

Past industrial practices in the cantonment area have resulted in contamination of shallow groundwater associated with two locations, a former fire training pit and a former vehicle maintenance shop, with low concentrations of petroleum products and trichloroethylene (TCE), respectively. The concentrations of petroleum products have decreased over time. Monitoring for these contaminants is continuing. There is no evidence of contaminants in existing drinking water wells on or off the installation (Bartz 2009).

Resource protection wells associated with the Unserviceable Munitions Treatment Unit, which was clean-closed in 2003, were decommissioned in May 2007. If any groundwater contamination had been present, monitoring would have continued.

Of the four resource protection wells at the Limited Purpose Landfill, only the upgradient well has consistently produced water. In April 2009, the three original downgradient wells were decommissioned and replaced with three new wells, only one of which produces water. The landfill is developed in a location where water presence and movement is extremely limited (Bartz 2009).

A resource protection well was installed in April 2009 to monitor any movement of contaminated water that may occur from an April 2008 release of fuel from the Central Fuel Facility. Although the well is developed at the level thought to be water bearing, no water has been observed in the well (Bartz 2009).

5.2.2.3 Groundwater Use

The drinking water supply for YTC is provided entirely from groundwater sources. Six wells provide water for three permitted drinking water distribution systems located in the cantonment area and at Yakima Research Station (YRS) and the MPRC. Prior to distribution and use, this water is treated at the wellhead by chlorination. The remaining wells are located throughout the training area. That water is treated as needed (Bartz 2009).

Water for the permitted drinking water distribution system in the cantonment area is supplied by three wells and stored in two tanks with a combined storage capacity of 1,130,000 gallons (4.28 million L). At YRS, there are two wells with a combined storage capacity of 375,000 gallons (1.42 million L). MPRC has one well with a storage capacity of 1,200 gallons (4,500 L). The remaining eight wells located within the range areas have a combined storage capacity of 415,300 gallons (1.57 million L) (Bartz 2009).

Non-potable water for fire suppression is currently obtained from both ground and surface water sources. Potable water from developed wells is also available for use. There are currently 24 fast-fill wells, three spring-fed fast-fill wells, two fast-fill tanks (which are kept filled through water delivery by the YTC Fire Department), and six ponds scattered around YTC for use in fire suppression activities. Surface water from the Columbia River represents one of the primary sources of water for aerial firefighting. In addition, YTC is in the process of drilling a new well that can be used for wildfire management (McDonald 2009c).

Water used by troops during training would either be drawn from the cantonment area system and hauled to the field, or drawn from one of the training area wells (Army 1994). Summer water demand at YTC averaged approximately at 200,000 gpd (757,000 L per day) in 1994. Approximately three fourths of this water came from the cantonment area system (Army 1994). YTC currently has sufficient water resources to meet and surpass the existing maximum water demand. Deep aquifer water supplies are adequate for any foreseeable needs at YTC (Army 2005c).

5.3 BIOLOGICAL RESOURCES

5.3.1 Vegetation

5.3.1.1 Plant Communities

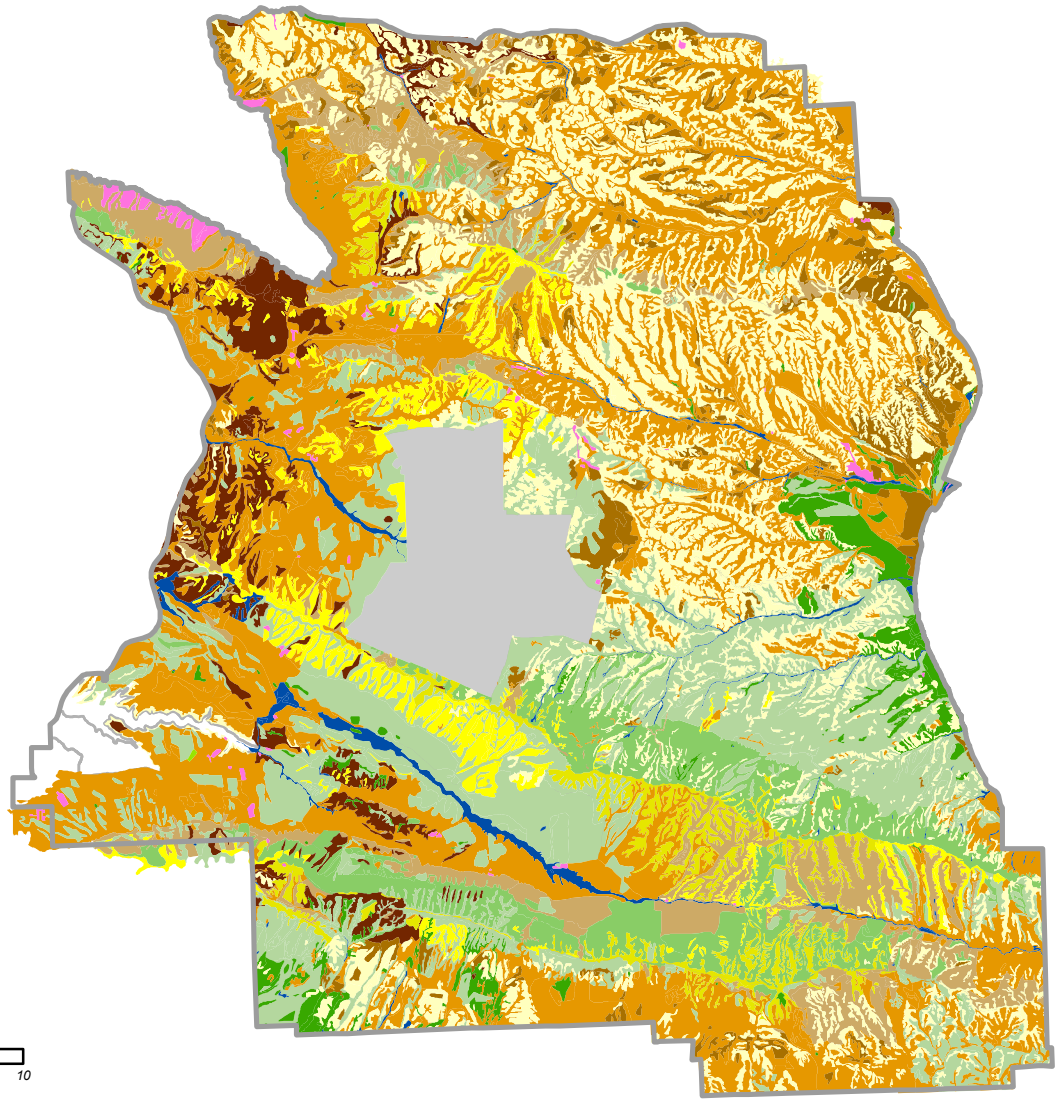
Like much of the lower Columbia River Basin, YTC is characterized by shrub-steppe vegetation. The shrub-dominated overstories typically support species of sagebrush and other shrubs, and the understories support perennial bunchgrasses, such as bluebunch wheatgrass and Sandberg's bluegrass (Daubemire 1970).

In 1999, a comprehensive survey of upland vegetation was completed on YTC, and plant communities were delineated (The Nature Conservancy 1999). YTC ENRD divides vegetation into 18 classes based on similarities in cover of dominant species, perennial forbs, exotic weeds, and perennial bunchgrasses. In general, upland plant communities include shrublands, grasslands, and dwarf shrublands, with a small component of communities that do not fit into one of these classes (**Figure 5–2**, **Table 5-4**, Jones and Bagley 1998). Shrublands are typically dominated by big sagebrush, with bunchgrasses and annual and perennial forbs in the understory. Grasslands are similar to shrublands, except that the shrub component is greatly reduced or absent, has been eliminated by some type of disturbance (e.g., fire, military training), or is represented by rabbitbrush, which may sprout vigorously after a fire. Dwarf shrublands, typically found in areas with shallow, stony soils, are dominated by Sandberg's bluegrass and a layer of dwarf shrub species including buckwheat and stiff sagebrush (**Figure 5–2**, **Table 5-4**).

5.3.1.2 Noxious Weeds

Noxious weed species can pose a threat to the ecological integrity of training lands, increasing soil loss and decreasing upland vegetative cover, surface water quality, and wildlife habitat. In addition, noxious weeds may potentially pose economic threats by spreading off the installation to surrounding agricultural fields and waterways. Noxious weed control at YTC is accomplished through an Integrated Pest Management (IPM) approach, as documented in the IPMP, which is mandated by federal and state noxious weed control statutes and Army Regulation 200–1 (Nissen and Cochrane 2005). The IPM strategy focuses on long-term prevention or suppression of noxious weed problems using techniques that have a limited impact on the environment including natural biological control, low-toxicity pesticides, and mechanical control. As part of its pest management program, YTC controls noxious weeds in training areas, with a primary focus on knapweed and kochia control, and a lesser focus on musk thistle, Scotch thistle, Russian thistle, and purple loosestrife. With the exception of purple loosestrife, these species typically invade upland sites or establish themselves along intermittent drainages following a disturbance. Purple loosestrife, which is found in wetland and riparian areas, is particularly difficult to control because the Columbia River provides a continual seed source for this species.

Chemical control of knapweed requires intensive effort on the part of the pest management program and includes the application of herbicides by aerial and ground methods. Six biological control agents have been released at YTC for control of two species of knapweed found on the installation. Mechanical control methods include chopping of small musk and Scotch thistle populations. Best management practices to control weeds and invasive vegetation include site restoration to prevent re-invasion by these species, as well as vehicle wash practices for tactical units prior to their departure from the installation.



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- Big sagebrush/bunchgrass
- Big sagebrush - bitterbrush/bunchgrass
- Big sagebrush - three-tip sagebrush/bunchgrass
- Big sagebrush - stiff sagebrush/bunchgrass
- Stiff sagebrush/bunchgrass
- Goldenweed/bunchgrass
- Thyme leaf buckwheat/bunchgrass
- Three-tip sagebrush/bunchgrass
- Bunchgrass
- Sandberg's bluegrass-cheatgrass
- Cheatgrass
- Riparian
- Disturbed
- Impact Area

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Figure 5-2
Vegetation Communities on
Yakima Training Center

ANALYSIS AREA: Yakima & Kittitas Counties, Washington	
Date: 7/16/2009	File: Arcadis\DEIS Figures.mxd
Prepared By: KA	Layout: ProjectArea.pdf

Table 5-4 Upland Plant Communities Occurring on Yakima Training Center

Plant Community	Description	Acres	Percent
Big sagebrush/ bunchgrass	Big sagebrush with perennial bunchgrass understory; gentle upland slopes with deep silty loams or loamy soils.	78,799	24.2
Sparse big sagebrush/bunchgrass	Sagebrush cover patchy or < 5%; lower cover of perennial bunchgrasses; downy brome present; typically has experienced some level of past disturbance.	18,734	5.8
Big sagebrush – stiff sagebrush/bunchgrass	Big sagebrush and stiff sagebrush co-dominate shrub layer; bunchgrass understory; occurs where soils not uniformly deep.	35,233	10.8
Stiff sagebrush/ bunchgrass	Stiff sagebrush co-occurs with purple sage, thyme buckwheat, and bitterbrush; Sandberg's bluegrass is dominant bunchgrass; occurs on shallow, rocky soils.	42,573	13.1
Big sagebrush – bitterbrush/ bunchgrass	Big sagebrush and bitterbrush in shrub layer; bunchgrasses include bluebunch wheatgrass, needle and thread grass; Sandberg's bluegrass, and Thurber's rice grass; occurs on soils that tend to be shallower and stonier, contain more gravels, or are sandier than deep loamy soils.	14,376	4.4
Big sagebrush – three tip sagebrush/bunchgrass	Bunchgrasses include bluebunch wheatgrass and occasional Idaho fescue; occurs on mesic sites: relatively deep soils, usually at higher elevations or on slopes with northerly aspects.	14,978	4.6
Big sagebrush - three tip sagebrush/high bunchgrass	Differs from above by having Idaho fescue at high densities, higher bunchgrass cover, and higher forb cover; occurs on deep soils at higher elevations and on north-facing slopes.	13,543	4.2
Three tip sagebrush/ bunchgrass	Patches or very low cover of three tip sagebrush; understory grasses dominated by bluebunch wheatgrass; occurs on deep soils at mesic, higher elevations.	3,382	1.0
Three tip sagebrush/high bunchgrass	Main understory bunchgrass is Idaho fescue; higher bunchgrass and forb cover than above; occurs at upper elevations.	17,987	5.2
Big sagebrush – greasewood/giant wildrye – saltgrass	Often dominated by big sagebrush in association with bluebunch wheatgrass and Great Basin wildrye; occurs in low-lying drainages and seeps or along small streams; alkalinity tolerance.	2,747	0.8
Rabbitbrush/ bunchgrass	Bunchgrass component usually either bluebunch wheatgrass or Sandberg's bluegrass; found on relatively deep soils; usually occurs where prior disturbance has removed big sagebrush.	13,576	4.2
Goldenweed/bunchgrass	May contain scattered round-headed buckwheat and low densities of bitterbrush; bunchgrasses are typically bluebunch wheatgrass and Sandberg's bluegrass; occurs on shallow, rocky soils, usually along or near the tops of ridges or hills.	8,722	2.7
Thyme-leaf eriogonum/bunchgrass	May contain scattered shrubs (stiff sagebrush, big sagebrush, bitterbrush); understory: Sandberg's bluegrass, patchy bluebunch wheatgrass, Douglas wild buckwheat, round-headed buckwheat; occurs in thin rocky soils along ridgetops and hilltops.	8,606	2.6
Bunchgrass	Dominated by bluebunch wheatgrass or Idaho fescue with occasional shrubs; occurs on deep, well-drained soils that may ultimately support big sagebrush.	30,742	9.4
Sandberg's bluegrass – downy brome	Occurs in patches; on loamy or silty soils with relatively recent disturbance; some on rocky soils.	4,094	1.3
Downy brome (cheatgrass)	High densities of downy brome and other weedy species, rare occurrences of native species; weed cover usually close to 100%; generally on deep soils.	178	0.1
Riparian	Streamside woody vegetation; may be underrepresented by study.	858	0.3
Disturbed, facility, developed	Areas where all vegetation has been removed; includes facilities, buildings, parking lots, and gravel pits.	1,580	0.5

Source: Army 2002b

Control measures for purple loosestrife include chemical applications and release of biological control agents. Because the species is located in sensitive locations, biological control will be the emphasis of future control activities (Army 2002b).

5.3.1.3 Special Status Species

Federal or state plant species of concern occurring on YTC are listed on **Table 5-5**. These species have been designated as such because their populations are declining or their habitat is threatened. No plant species known to occur on YTC are federally listed under ESA. The three plant species listed on **Table 5-5** that are federally listed or candidates for federal listing (northern wormwood, Umtanum desert buckwheat, and Ute ladies'-tresses) are not known to occur on YTC, although suitable habitat may exist on the installation. The following sections describe federal plant species of concern on YTC.

Table 5-5 Special Status Plant Species That Occur on Yakima Training Center

Common Name	Scientific Name	Federal Status[1]	State Status[1]
Beaked cryptantha	*Cryptantha rostellata*	--	T
Beaked spike-rush	*Eleocharis rostellata*	--	S
Bristle-flowered collomia	*Collomia macrocalyx*	--	S
Cespitose evening-primrose	*Oenothera caespitosa ssp. Caespitosa*	--	S
Columbia milk-vetch	*Astragalus columbianus*	SC	S
Coyote tobacco	*Nicotiana attenuata*	--	S
Dwarf evening-primrose	*Camissonia pygmaea*	--	S
Gray cryptantha	*Cryptantha leucophaea*	SC	S
Hoover's desert-parsley	*Lomatium tuberosum*	SC	S
Hoover's tauschia	*Tauschia hooveri*	SC	T
Kalm's lobelia	*Lobelia kalmii*	--	E
Miner's candle	*Cryptantha scoparia*	--	S
Narrow-stem cryptantha	*Cryptantha gracilis*	--	S
Northern wormwood[2]	*Artemisia borealis var. wormskioldii*	C	E
Nuttall's sandwort	*Minuartia muttallii ssp. fragilis*	--	T
Pauper milk-vetch	*Astragalus misellus var. pauper*	--	S
Suksdorf's monkey-flower	*Mimulus suksdorfii*	--	S
Umtanum desert buckwheat[2]	*Eriogonum codium*	C	E
Ute ladies'-tresses[2]	*Spiranthes diluvalis*	T	E
White eatonella	*Eatonella nivea*	--	T

Notes:
1. E = endangered; T = threatened; C = candidate; S = sensitive; and SC = species of concern.
2. This species is not known to occur on YTC.
Sources: USFWS 2008c, f; WNHP 2008c

Fort Lewis Regulation 420–5 provides protective measures for populations of sensitive plant species that have the potential to be damaged by military training activities on YTC. Designated populations of Columbia milk-vetch, dwarf evening-primrose, Hoover's tauschia, Kalm's lobelia, and white eatonella are protected through Seibert (Siber) staking.

5.3.1.3.1 Columbia Milk-Vetch

The sensitive species with the most extensive occurrence on YTC is the Columbia milk-vetch. This species, which is state-listed as sensitive and a species of concern at the federal level, is found only in a 100-square-mile (29,000 ha) area along the west side of the Columbia River near Priest Rapids,

in Kittitas, Yakima, and Benton Counties (Mastrogiuseppe and Gill 1988, WNHP 2008a). The Columbia milk-vetch is found in sagebrush habitat at elevations from 425 to 1,300 feet (129 to 396 m). It grows on a variety of substrates, from water-washed cobbles and gravels near the Columbia River to deep sandy-loam soils on moderate slopes and in valleys. On YTC, this species has been found at more than 16 locations. Most of these occurrences are located on the eastern portion of the installation, within several miles of the Columbia River.

The Columbia milk-vetch is tolerant of mild disturbances, such as light grazing, moderate amounts of foot-traffic, and limited off-road vehicle traffic (Army 2001a). However, frequent disturbances to the soil can adversely affect this species by facilitating the invasion of non-native annuals, such as downy brome, which prevent the recolonization of the milk-vetch (Mastrogiuseppe and Gill 1988).

5.3.1.3.2 Gray Cryptantha

Gray cryptantha is a regional endemic, known from the Columbia River and lower Yakima River in the western Columbia Basin, from Wenatchee, Washington to The Dalles, Oregon. In Washington, the species is currently known from Benton, Franklin, Grant, Kittitas, Walla Walla, and Yakima Counties, and historically from Douglas County. On YTC, it is found along the Columbia River (YTC ENRD 2006a). Gray cryptantha is restricted to sand dunes that have not been completely stabilized (i.e., areas where there is still some movement of sand) and appears to be dependent on the strong winds of the region and the availability of open sand.

Off-road vehicle use and increased weed invasions are the primary threats to the gray cryptantha. Downy brome, knapweed, and Russian thistle have all become established within portions of the species' habitat. Changes in sand deposition and agricultural conversion also pose threats (Hitchcock et al. 1959). Gray cryptantha is listed as a federal species of concern and as a state sensitive species.

5.3.1.3.3 Hoover's Desert-parsley

Hoover's desert-parsley is limited to the Columbia Basin of Washington, occurring only in Yakima County and adjacent portions of Benton, Grant, and Kittitas Counties (WNHP 2008b). The species occurs on loose talus, within the big sagebrush/bluebunch wheatgrass vegetation zone, typically on east- to north-facing slopes. It is also found in drainage channels of open ridgetops and talus on south to southwest facing slopes. Hoover's desert-parsley occurs at elevations from 600 to 2,300 feet (183 to 701 m), and has few competitors because of the harsh, rocky, and often unstable environment in which it occurs. On YTC, the species occurs in two areas within 0.5 mile (0.8 km) of the Columbia River that are outside designated maneuver corridors, and in Selah Canyon (Downs et al. 1992). Hoover's desert-parsley is state listed as sensitive, and is a species of concern at the federal level.

5.3.1.3.4 Hoover's Tauschia

A regional endemic of the Columbia Basin, Hoover's tauschia occurs from Toppenish Ridge in south central Yakima County, northward to the southeastern foothills of the Wenatchee Mountains in east-central Kittitas County. The species is found on basalt lithosols in sagebrush habitats, at elevations of 1,400 to 3,000 feet (427 to 914 m). On YTC, Hoover's tauschia occurs on the south slopes of Yakima Ridge in Selah Canyon and at several sites in the northern portion of YTC. One population of this species is protected on the installation. Hoover's tauschia is state listed as threatened and is a species of concern at the federal level.

5.3.1.3.5 Northern Wormwood

Northern wormwood is a low-growing, tap-rooted biennial or perennial. Historically known from eight sites, northern wormwood is currently known from two populations in Klickitat and Grant Counties, Washington. This plant is restricted to exposed basalt, cobbly-sandy terraces, and sand habitat along the shore and on islands in the Columbia River. The two sites are separated by

200 miles (322 km) of the Columbia River and three large hydroelectric dams. The Klickitat County population is declining, and the status of the Grant County population is unclear. However, both are vulnerable to environmental variability. Surveys have not detected any additional plants. Threats to northern wormwood include direct loss of habitat through regulation of water levels in the Columbia River and placement of riprap along the river bank, trampling of plants as a result of recreational use, competition with nonnative invasive species, burial by wind- and water-borne sediments, small population sizes, susceptibility to genetic drift and inbreeding, and the potential for hybridization with two other species of Artemisia. Northern wormwood is a federal candidate species and state listed endangered species (USFWS 2008b).

5.3.1.3.6 Umtanum Desert Buckwheat

This species is a long-lived, slow-growing, woody perennial plant that forms low, dense mats. The species occupies a single location on the Hanford National Monument in Washington State. It is found only on an exposed basalt ridge; it is not known if this association is related to the chemical or physical characteristics of the bedrock or other factors. Individual plants may exceed 100 years of age based on counts of annual growth rings. A count in 1997 reported 5,228 individuals; by 2005, the figure had dropped to 4,418, declining 15 percent over 8 years.

The major threats to the species are wildfire, firefighting activities, trampling, and invasive weeds. However, the relationship between the decline in population numbers and the known threats is not understood at this time. With the possible exception of wildfire, the observed decline in population numbers and recruitment since 1997 is not directly attributable to the currently known threats. Because the population is small, limited to a single site, and sensitive to fire and disturbance, the species remains vulnerable to the identified threats. Umtanum desert buckwheat is a federal candidate species and state listed endangered species (USFWS 2008b).

5.3.1.3.7 Ute Ladies'-tresses

Ute ladies'-tresses is an orchid that is typically found at elevations of 1,500 to 7,000 feet (457 to 2,135 m). It is endemic to mesic or wet meadows and riparian/wetland habitats near springs, seeps, lakes, or perennial streams. Soils may be inundated early in the growing season, normally becoming drier but retaining subsurface moisture through the season.

This species occurs in areas where the vegetation is relatively open, but some populations are found in riparian woodlands or riparian shrub communities. Soils range from fine silt/sand to gravel and cobbles, and sometimes highly organic or peaty soils. In some areas, the wetland habitats and soils that support this species are moderately to strongly alkaline.

This species has not been found on YTC, although potential habitat for the species does occur on the installation (Army 2001a). Ute ladies'-tresses is listed as a federal threatened species and state endangered species.

5.3.2 Fish and Aquatic Resources

5.3.2.1 Fish Species and Populations

Portions of the Columbia and Yakima River watersheds are on YTC. The Columbia and Yakima River systems support anadromous and resident salmonids, with numerous other cold water and warm water fish species (Army 2002b).

YTC lies near the west bank of the Columbia River, from Getty's Cove to Priest Rapids Dam. This reach of the Columbia River offers limited spawning habitat for anadromous salmonids, although significant spawning by fall Chinook does occur approximately 4 miles (6 km) downstream from the Priest Rapids Dam.

The five subdrainage systems on YTC that are tributaries to the Columbia River (Alkali Canyon, Corral Canyon, Hanson Creek, Johnson Creek, and Middle Creek) are intermittent within their headwaters. However, their lower reaches may be perennial some years. Chinook salmon fry have been observed using the lower reaches of Hanson, Alkali Canyon, and Corral Canyon Creeks for early rearing (Rogers et al. 1989). However, these creeks are too small for Chinook salmon to spawn in them. Johnson Creek, downstream of YTC, contains both resident and anadromous (steelhead) forms of rainbow trout. Several adult steelhead have also been observed in this lower reach of Johnson Creek.

Numerous other cold water and warm water species, such as walleye, various sunfish, minnows, and suckers, inhabit this reach of the Columbia River. Other fish species found in streams on the installation include the threespine stickleback, largescale sucker, mountain sucker, longnose dace, chiselmouth, prickly sculpin, redside shiner, and the non-native eastern brook trout. Fish species present in these streams are listed on **Table 5-6**.

Table 5-6 Yakima Training Center Streams and Known Fish Presence on the Installation

Name	Length on YTC (miles)	Length on YTC (km)	Base Flow (cubic feet per second)	Fish Species	Perennial Flow
Alkali Creek	13.8	22	1.34	Rainbow trout, fall Chinook fry, eastern brook trout	Yes
Badger Creek	4.9	7.9	Intermittent/ephemeral	No fish	No
Burbank Creek	2.4	3.9	Intermittent/ephemeral	No fish	No
Cold Creek	8.0	12.9	0.60	No fish	No[1]
Corral Canyon	8.5	13.7	Intermittent/ephemeral	Fall Chinook fry	Yes
Cottonwood Creek	6.7	10.8	Intermittent/ephemeral	No fish	No
Cow Creek	4.4	7.1	Intermittent/ephemeral	No fish	No
Dry Creek	--	--	Intermittent/ephemeral	No fish	No
Foster Creek	3.2	5.1	0.14	No fish	No
Hanson Creek	13.4	21.6	0.88	Eastern brook trout, fall Chinook fry, longnose dace	Yes
Johnson Creek	13.6	21.9	0.67	Rainbow trout, cottids, chiselmouth, possibly steelhead, threespine stickleback, prickly sculpin, large-scale sucker, redside shiner	Yes
Johnston Creek	5.1	8.2	Intermittent/ephemeral	No fish	No
Lmuma Creek	7.2	11.6	6.08	Rainbow trout, mountain sucker, longnose dace, speckled dace	Yes
Middle Canyon	12.2	19.6	Intermittent/ephemeral	Rainbow trout	Yes
N. Fork Lmuma Creek	6.0	9.7	Intermittent/ephemeral	No fish	No
Pomona Creek	2.7	4.3	Uncertain[1]	No fish	No
Selah Creek	26.6	42.8	1.02	No fish	No[2]
Sourdough Creek	4.0	6.4	Intermittent/ephemeral	No fish	No
Whipple Creek	4.5	7.2	Intermittent/ephemeral	No fish	No

Notes:

1. Stream goes subsurface beyond the YTC boundary.
2. Used as an irrigation return.

Sources: Army 2002b; YTC ENRD 2006c, d; 2007a, d; 2008a; Roberts 2003; Wandler 2003

The Yakima River supports approximately 33 fish species (Patten et al. 1970). The reach of the Yakima River adjacent to YTC supports a substantial recreational fishery for resident rainbow trout. Although a small population of spring Chinook salmon occurs below the Roza Dam, the reach adjacent to YTC is the primary rearing habitat for spring Chinook salmon juveniles originating from upper Yakima River spawning areas (Northwest Power Planning Council 1990). Lmuma Creek within the Yakima River watershed supports populations of rainbow trout, mountain sucker, and longnose dace. Fish stocks exist in both perennial and non-perennial streams within these watersheds. Badger, Burbank, Cold, and Selah Creeks, found within the Yakima River watershed on YTC, do not support fish populations (Army 2002b).

Limited monitoring of fish occurs on YTC. An inventory was conducted in expansion area streams in 1988 and in Hanson Creek in 1991, and fish were inventoried in Alkali, Johnson, and Lmuma Creeks in 1993. All perennial streams on YTC were surveyed for fish in 1994, and two were surveyed in 1999. General fish surveys were conducted in several streams on YTC during 2005, 2006, and 2007. Steelhead spawning surveys were conducted in 2007 and 2008 (YTC ENRD 2006c, d; 2007a, d; 2008a).

5.3.2.2 Fish Habitat

Fire and military training and livestock grazing activities have affected fish and their habitat at YTC. Land use activities have accelerated erosion and stream sedimentation, influenced stream flow and temperature, and limited large woody debris and other vegetative structure. Degradation of most streams at YTC may be partially attributed to higher peak flows and lower base flows, in part from noxious weeds invading riparian areas and forming monocultures with taproots that are less able to hold soil than fibrous root systems of native plants (Army 2002b). Activities that promote channel incision and bank erosion (such as noxious weed invasions) may affect shifts in volume and timing of surface and sub-surface water flows.

Land management and restoration efforts have improved fish habitat in several streams on YTC (Army 2002b). A riparian assessment conducted from 1996 to 1999 indicated that riparian areas benefited from Seibert staking and elimination of livestock grazing. A riparian assessment conducted during 2001 to 2003 found a decrease in invasive plant species, an improved vascular plant community, and an increase in vegetative litter along streams compared to earlier studies. These improvements occurred despite drought conditions during 1998 through 2002 (Bonsen et al. 2006). Furthermore, fish habitat on the installation has been protected through riparian plantings, road improvements near riparian areas, hardening of stream crossings, and fish passage improvements at crossings.

The reach of the Yakima River adjacent to YTC is a deep, narrow canyon. The river flow is fast with very few gravel bars to support anadromous fish spawning. The nearest salmon spawning area to YTC in this basin is below Roza Dam. The mainstem below Roza Dam becomes progressively degraded due to agricultural and municipal impacts. Fine sediment loading and high summer water temperatures from irrigation returns are the primary factors limiting salmonid production in the mainstem below Yakima. The stream reaches between YTC and the Yakima River have been degraded because of grazing practices, further reducing the likelihood of salmonids from the Yakima River occurring on YTC. Tributaries to the Yakima River at YTC include Lmuma, Burbank, Selah, and Cold Creeks. Of these, Lmuma Creek is known to contain rainbow trout. The other three are barren of salmonids, with Cold Creek heavily degraded because of cattle grazing (Army 2001a).

5.3.2.3 Special Status Species

Table 5-7 lists the four federally listed fish species that occur in the vicinity of YTC. None of these species are known to use rivers and streams on YTC. Although mid-Columbia steelhead may be present in Johnson Creek downstream of the installation, there is no contiguous flow between this area and YTC. Recent fish inventory surveys, including steelhead spawning surveys, have not documented the presence of steelhead (adult or any other life stage) on YTC (YTC ENRD 2007d, 2008a). Critical habitat has been designated in the vicinity of YTC for the salmonids, but YTC is excluded from the designation.

Table 5-7 Special Status Fish Species On or Near Yakima Training Center

Species	Scientific Name	Federal Status[1]	State Status[1]
Bull trout	*Salvelinus confluentus*	T	C
Chinook salmon (Upper Columbia Spring Run)	*Oncorhynchus tshawytscha*	E	C
Steelhead trout (Mid-Columbia)	*Oncorhynchus mykiss*	T	C
Steelhead trout (Upper Columbia)	*Oncorhynchus mykiss*	E	C

Note:
1. E = endangered; T = threatened; and C = candidate.
Sources: Army 2002b, NMFS 2008a, USFWS 2008c, f; WDFW 2008b

5.3.2.3.1 Bull Trout

The Columbia River bull trout DPS consists of all populations in the Columbia Basin, which includes four major stocks: the Yakima, Wenatchee, Entiat, and Methow Rivers. Bull trout in the Columbia Basin DPS spawn in September and sometimes into mid-October, depending on the subpopulation. Variations in timing likely follow temperature patterns in the various tributaries. Movement into spawning areas is not well documented, but likely varies among resident, fluvial, and adfluvial type fish and habitat constraints in the various drainages. In general, movement toward spawning areas occurs in late summer. Spawning areas are characteristically cold, clean reaches within complex habitat, large woody debris, and preferentially with groundwater influence.

Although there has been some mention of potential bull trout spawning and rearing habitat on YTC (Bottorff and Swanson 1993), this is highly unlikely. Streams on YTC are not cold enough for long enough periods of time to provide suitable spawning and rearing habitat. In addition, most streams do not have continuous flow from the installation to either the Yakima or Columbia Rivers during the time in which bull trout would potentially be spawning or migrating to spawn. However, bull trout could forage in streams on YTC for short periods of time when temperatures are tolerable and flows are perhaps more suitable. If there is any use, it is likely to be short-term in nature and located at the mouths of streams during the colder months when streams may provide more tolerable temperatures and dependable flows. Although some suitable foraging habitat may be found on YTC in Johnson, Hanson, and Alkali Creeks (tributaries to the Columbia River), bull trout have never been documented on YTC. The nearest known resident population of bull trout occurs approximately 24 miles (39 km) from YTC. There is also a fluvial stock found within the mainstream of the Yakima River, located approximately 4 miles (6.4 km) from the nearest training area on YTC (WDFW 1998).

Critical habitat for Columbia River bull trout DPS extends from the Columbia River mouth and estuary throughout the Columbia Basin, including all tributaries historically accessible to the species. Areas covered by the Federal Columbia River Power System, which includes those waters on and adjacent to YTC, are excluded from the critical habitat designation (pursuant to the National Defense Authorization Act for Fiscal Year 2004).

5.3.2.3.2 Chinook Salmon

Included in the Upper Columbia ESU are all naturally spawned populations occurring in all accessible river reaches in the Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. The Upper Columbia spring Chinook salmon ESU includes all wild stocks upstream of the Wenatchee River confluence, and includes the Yakima River system. All nine stocks are considered depressed due to chronically low escapement, a long-term negative trend, or a short-term severe decline in escapement. All stocks are native with wild production except for the Methow stock, which has composite production because of hatchery stray introgression (NMFS 2008a).

Upper Columbia spring-run Chinook salmon migrate past YTC through the Yakima River drainage. This area also serves as an over-wintering area for spring-run Chinook. All streams and drainages on YTC are located outside this ESU. The reach of Columbia River adjacent to YTC is a migratory corridor for these fish and individual residence times can be measured in days rather than weeks. Upriver runs start passing YTC in early May and extend through August based on counts at Priest Rapids Dam. Spawning occurs from late August to mid-September, and all documented spawning areas in this ESU are upstream of YTC (Cummins 1999, Army 2002b).

YTC is excluded from critical habitat designation for Upper Columbia spring-run Chinook salmon (pursuant to the National Defense Authorization Act for Fiscal Year 2004). However, the Columbia River immediately adjacent to the installation is designated critical habitat for this ESU.

5.3.2.3.3 Steelhead

Three Upper Columbia River ESU steelhead stocks are present in the Columbia River adjacent to the installation and include the Wenatchee, Entiat, and Methow/Okanogan populations. Similar to Chinook salmon, steelhead from the upper Columbia River are transient residents in the Wanapum and Priest Rapids reservoirs of the Columbia River, migrating past as either adults or juveniles. All three stocks are considered depressed, mixed stock, and maintained with composite production.

The Mid-Columbia River ESU extends from the Klickitat River to the Yakima River, excluding the Snake River, and includes reaches of the Klickitat, Deschutes, John Day, Umatilla, Walla Walla, Yakima, and Columbia Rivers. The Yakima River is located adjacent to the installation's western boundary, and flows into the Columbia River downstream of YTC.

Of the streams on YTC, Johnson Creek contains both resident (rainbow trout) and anadromous steelhead (Rogers et al. 1989, Army 1994, Cummins 1998), and is considered part of the threatened Mid-Columbia ESU. Several adults have been observed in the lower portions of this creek. Upper Columbia River ESU steelheads are not known to utilize streams on YTC.

Habitat on YTC is excluded from critical habitat designation for Upper Columbia River steelhead (pursuant the National Defense Authorization Act for Fiscal Year 2004). However, the Columbia River immediately adjacent to the installation is designated critical habitat for this ESU.

Critical habitat for the Mid-Columbia steelhead ESU has been determined to include all tributaries known to support steelhead within the ESU boundary, the main body of the Columbia River downstream of the Yakima River, and the Columbia River estuary. Habitat on YTC is excluded from critical habitat designation for Mid-Columbia River steelhead (pursuant to the National Defense Authorization Act for Fiscal Year 2004). However, the Yakima River immediately adjacent to the installation is designated critical habitat for this ESU.

5.3.3 Wildlife Resources

5.3.3.1 Wildlife Habitat

The wildlife at YTC uses three predominant habitat types in accordance with their specific life history requirements: shrub-steppe uplands, cliffs and talus slopes, and riparian and permanently wet areas. Shrub-steppe uplands account for more than 95 percent of land coverage at YTC and provide life requisites for the majority of wildlife species that permanently or seasonally inhabit the installation (Army 2002b). The open, shrubby habitats support numerous shrub-nesting and ground-nesting birds and mammals. In addition, reptiles and raptors feed on the diversity of small mammals and invertebrates that are found in the sage complexes of YTC. Cliffs and talus slope habitats provide shade, cover, and rearing sites. Habitats associated with watercourses, springs, and riparian communities support a wide variety of wildlife by providing drinking water, cover, and in some cases, important food and nesting opportunities.

5.3.3.2 Wildlife Species and Populations

A total of 246 wildlife species occur or are likely to occur on YTC: 8 amphibians, 14 reptiles, 174 birds, and 50 mammals (Johnson and O'Neil 2001, Army 2002b).

5.3.3.2.1 Amphibians and Reptiles

Of the 22 species of amphibians and reptiles that are thought to occur at YTC, four typically inhabit sagebrush and cliff and talus slope habitats: side-blotched lizard, sagebrush lizard, western fence lizard, and striped whipsnake. The most common species found in riparian habitats include Pacific treefrogs and long-toed salamanders. Other species, such as short-horned lizards, gopher snakes, and western rattlesnakes, are more evenly distributed throughout the landscape at YTC.

5.3.3.2.2 Birds

The most common avian species found on YTC are the western meadowlark, Brewer's sparrow, vesper sparrow, horned lark, and sage thrasher. Birds commonly associated with sagebrush habitat year-round include the greater sage-grouse, golden eagle, prairie falcon, common raven, rock wren, and horned lark. Summer residents of YTC include Swainson's and red-tailed hawks, American kestrel, burrowing and short-eared owls, mourning dove, common nighthawk, sage thrasher, and sage sparrow. Winter residents include the rough-legged hawk, rosy finch, northern shrike, and bald eagle. Upland game birds include chukar, California quail, ring-necked pheasant, and Hungarian partridge. Riparian habitats provide some permanent water supplies for waterfowl (such as mallard, gadwall, cinnamon teal, blue-winged teal, wood duck, and shoveler) and a variety of songbirds. Additionally, bald eagles and osprey can be observed along river corridors. Cliff swallows are most commonly associated with cliffs, talus slopes, and riparian habitats, and may occur at the periphery of sage habitat.

Although many of these bird species are resident year-round on YTC, several species of birds, including raptors, waterfowl, sparrows, doves and nighthawks, are migratory birds that spend only a portion of the year on YTC. Migratory birds may winter or breed on YTC, or may just use the installation for short periods while migrating between their breeding grounds to the north and wintering grounds to the south. Migratory birds are protected under the Migratory Bird Conservation Act of 1929, as amended, that provides protections to reduce the risk of harm to migratory birds or their habitats from Army or other federal actions.

5.3.3.2.3 Mammals

Five small mammals represent 98 percent of all species identified during 1990 monitoring surveys: deer mouse, sagebrush vole, Great Basin pocket mouse, least chipmunk, and northern pocket gopher. Additional small and mid-sized mammal species typically found on YTC include black-tailed jackrabbit, Townsend's ground squirrel, Merriam's shrew, badger, porcupine, harvest mouse, and long-tailed vole. Large mammals found at YTC include cougar, coyote, mule deer, and elk. Mule deer are the predominant large mammal found at YTC, while coyote primarily use shrub habitats for hunting small mammals. A small number of elk are year-round residents on YTC.

Six species of mammal are typically found in riparian areas: raccoon, porcupine, mink, muskrat, beaver, and montane vole. Bushy-tailed woodrats and bighorn sheep occasionally use the cliffs and talus slopes. Bats, including the western small-footed bat, little brown bat, and big brown bat, may roost in the cliffs and talus slopes and feed along the riparian drainages by night (ENSR 1995a).

5.3.3.3 Special Status Species and Critical Habitat

Numerous special status wildlife species occur on or near YTC, as shown on **Table 5–8.** Some of these species may actually occur outside the project area, in small territories or isolated sites in Kittitas and Yakima Counties, but are included in this EIS because their names appear on lists obtained from the USFWS and WDFW. Federal status endangered, threatened, and candidate wildlife species, as well as other sensitive species that receive special management or are likely to be affected by the proposed activities on YTC, are discussed in more detail below.

5.3.3.3.1 Columbia Spotted Frog

Columbia spotted frogs are associated with a variety of aquatic habitats, including still water habitats, streams, and creeks (Hallock and McAllister 2005). Breeding occurs predominantly in unshaded areas in the flooded margins of wetlands, ponds, and lakes. Although common in other parts of Washington, only small, scattered populations occur in the Columbia Basin. The Columbia spotted frog is not known to occur on YTC, and suitable habitat for the species probably does not occur on the installation (ENSR 1995c).

5.3.3.3.2 Other Reptiles and Amphibians

Sagebrush lizards and striped whipsnakes, both candidates for state listing, typically inhabit sagebrush, cliff, and talus slope habitats (Army 2002b).

5.3.3.3.3 American White Pelican

American white pelicans, which are listed as endangered in Washington State, nest inland on islands in lakes and rivers (Seattle Audubon Society 2008). They feed in shallow lakes, rivers, and marshes, and typically migrate to warm coastal marine habitats in the winter. In Washington, American white pelicans have a localized distribution in the eastern portion of the state. Non-breeding American white pelicans can be found along the Columbia River (Doran et al. 2004), and this species is frequently observed immediately adjacent to YTC along the Columbia River. There have been no observations or recordings of the American white pelican at YTC (Army 2002b), although there have been several observations of pelicans flying over the installation between the Yakima and Columbia River systems.

Table 5–8 Wildlife Species of Concern Found on or Near Yakima Training Center

Common Name	Scientific Name	Federal Status[1]	State Status[1]
Reptiles and Amphibians			
Columbia spotted frog	*Rana pretiosa*	--	E
Northern leopard frog	*Rana pipiens*	SC	C
Sagebrush lizard	*Sceloporus graciosus*	SC	C
Sharp-tailed snake	*Contia tenuis*	SC	C
Striped whipsnake	*Masticophis taeniatus taeniatus*	--	C
Birds			
American white pelican	*Pelecanus erythrorhynchos*	--	E
Bald eagle	*Haliaeetus leucocephalus*	SC	S
Burrowing owl	*Athene cunicularia*	SC	C
Common loon	*Gavia immer*	--	S
Ferruginous hawk	*Buteo regalis*	SC	T
Golden eagle	*Aquila chrysaetos*	--	C
Greater sage-grouse	*Centrocercus urophasianus phaios*	C	T
Lewis's woodpecker	*Melanerpes lewis*	--	C
Loggerhead shrike	*Lanius ludovicianus*	SC	C
Merlin	*Falco columbiarus*	--	C
Northern goshawk	*Accipiter gentilis*	SC	C
Olive-sided flycatcher	*Contopus borealis*	SC	C
Sage sparrow	*Amphispiza belli*	--	C
Sage thrasher	*Oreoscoptes montanus*	--	C
Sandhill crane	*Grus canadensis*	--	E
Western grebe	*Aechmophorus occidentalis*	--	C
Yellow-billed cuckoo	*Centrocercus urphasianus phaios*	C	C
Mammals			
Black-tailed jackrabbit	*Lepus californicus*	--	C
Keen's myotis	*Myotis keenii*	--	C
Merriam's shrew	*Sorex merriami*	--	C
Townsend's big-eared bat	*Coryhorhinus townsendii*	SC	C
Townsend's ground squirrel	*Spermophilus townsendii*	SC	C
White-tailed jackrabbit	*Lepus townsendii*	--	C

Note:
1. E = endangered; T = threatened; C = candidate; S = sensitive; and SC = species of concern.
Sources: USFWS 2008c, f; WDFW 2008

5.3.3.3.4 Bald Eagle

On July 28, 2007, the USFWS delisted bald eagles that inhabit the lower 48 states because the species was meeting or exceeding established recovery goals throughout its range. However, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

On YTC, bald eagles are winter migrants that arrive between early October and late November, departing by the end of March (Stalmaster 1992b). They forage along the Columbia River at the installation's eastern boundary (at the Priest Rapids Reservoir) and roost at three sites along Hanson Creek and one site (Borden Springs) along the Columbia River (Army 2002b). YTC provides perching substrate along the western edge of the Columbia River for foraging and roosting.

Approximately 25 bald eagles feed on the Columbia River near YTC during the peak of the wintering season (February); about half of these eagles use roosts on YTC. Fires burned the Borden Springs site in 1996 and 2003 and, during 2006, bald eagles used the site only during the day. Alkali Canyon, a historic roost site, was burned in 1996 and has not been used since by bald eagles.

5.3.3.3.1 Burrowing Owl

Burrowing owls are found in shrub-steppe habitat in eastern Washington during the breeding season (Nordstrom 2004, Seattle Audubon Society 2008). They inhabit open, dry areas with soft soil and short grass, and use burrows for protection from predators and temperature extremes (Seattle Audubon Society 2008). Typically, they utilize abandoned burrows excavated by burrowing rodents or larger mammals (often unoccupied badger dens in the Pacific Northwest), although they are capable of digging their own burrows (Nordstrom 2004). Fifteen historic burrow nests have been documented on YTC (Fort Lewis Regulation 420–5), and the species is occasionally observed on the installation. The major factor contributing to the decline of burrowing owls has been habitat loss. All known active burrowing owl nests sites on YTC are protected from vehicle maneuvers by Seibert stakes.

5.3.3.3.2 Ferruginous Hawk

The ferruginous hawk is listed as a threatened species in Washington State. Ferruginous hawks breed in the Lower Columbia Basin of southeast Washington, and the surrounding arid lands (Richardson et al. 2004). They are obligate grassland or desert shrubland nesters, and prefer sparse, short vegetation in steppe and shrub-steppe habitats. In Washington, most ferruginous hawk nests are built on top of rocks, cliffs, and trees and most occur in rock outcroppings. The species has been extremely rare on YTC since 1993, although multiple historic nest sites have been located (Army 2002b). However, no ferruginous hawks have been documented nesting at YTC since 1993, and sightings of the species have been infrequent. Ferruginous hawks are sensitive to human disturbance and require isolation from military activity during the nesting season. Protective measures restricting military activity around active nests are listed in Fort Lewis Regulation 420–5.

5.3.3.3.3 Golden Eagle

Golden eagles commonly occur in open areas such as shrub-steppe and grassland habitat, open forests, and alpine parkland, and nest on cliffs or large trees (Watson and Whalen 2004, Seattle Audubon Society 2008). Both migratory and resident golden eagles occur on YTC (Army 2002b), and four historic nest sites have been identified at cliff sites on the installation (Fort Lewis Regulation 420–5). To protect golden eagles from human activity during the nesting season, nest buffers and overflight restrictions are in place at YTC, as described in Fort Lewis Regulation 420–5.

5.3.3.3.4 Greater Sage-grouse

There are greater sage-grouse populations throughout the western United States. Within Washington, only two populations of this species persist: one in Douglas and Grant Counties and one at YTC. These populations are isolated from the core range of this species. Suitable greater sage-grouse habitat consists of medium to dense sagebrush stands exhibiting a range of heights, as well as a variety of forbs and grasses (Hays et al. 1998). Sagebrush is an essential food for greater sage-grouse throughout the year, and comprises 60 to 80 percent of the species' diet (Remington and Braun 1985). Greater sage-grouse on YTC tend to use habitat with slopes of less than 15 percent, with Wyoming big sagebrush, three-tipped sagebrush, and bluebunch wheatgrass as the dominant species (Livingston and YTC 1998). Shrubs provide nests with shelter from avian predators and weather elements, while grasses provide shelter from ground predators and create a favorable microclimate

(WDFW 1995b). Critical periods of greater sage-grouse life history include lek (communal mating grounds) attendance, nesting, and brood rearing. Lek attendance is initiated in late winter/early spring and extends through mid-May. Nesting typically occurs March through May, and brood rearing extends through mid-June. Both nesting and brood rearing occur in relatively close proximity (i.e., within 5 miles [8 km]) to leks when suitable habitat exists (**Figure 5–3**).

YTC supports one of two distinct populations still present in Washington and the largest and only population of greater sage-grouse occurring primarily on federally owned land. These remaining populations are isolated from each other and larger contiguous populations located in the Columbia Basin and throughout the range of greater sage-grouse. Populations of greater sage-grouse on YTC have been characterized by short-term fluctuations and have exhibited trends similar to those of statewide populations, with male greater sage-grouse numbers per lek decreasing over time (Livingston and YTC 1998).

Annual surveys for leks and lek counts have been conducted on YTC since 1989 to monitor trends and assess population status. Eighteen known leks were monitored in 2008, and 12 were found to be active. Three of the 12 active leks were classified as major leks (i.e., 10 or more male greater sage-grouse observed at least once during the season). In 2009, the population estimate for greater sage-grouse on YTC was 185, which is the lowest estimate since 1995 and the second lowest population estimate for the 21-year period. The 21-year population average was 288. The peak population estimate of 421 occurred in 1999.

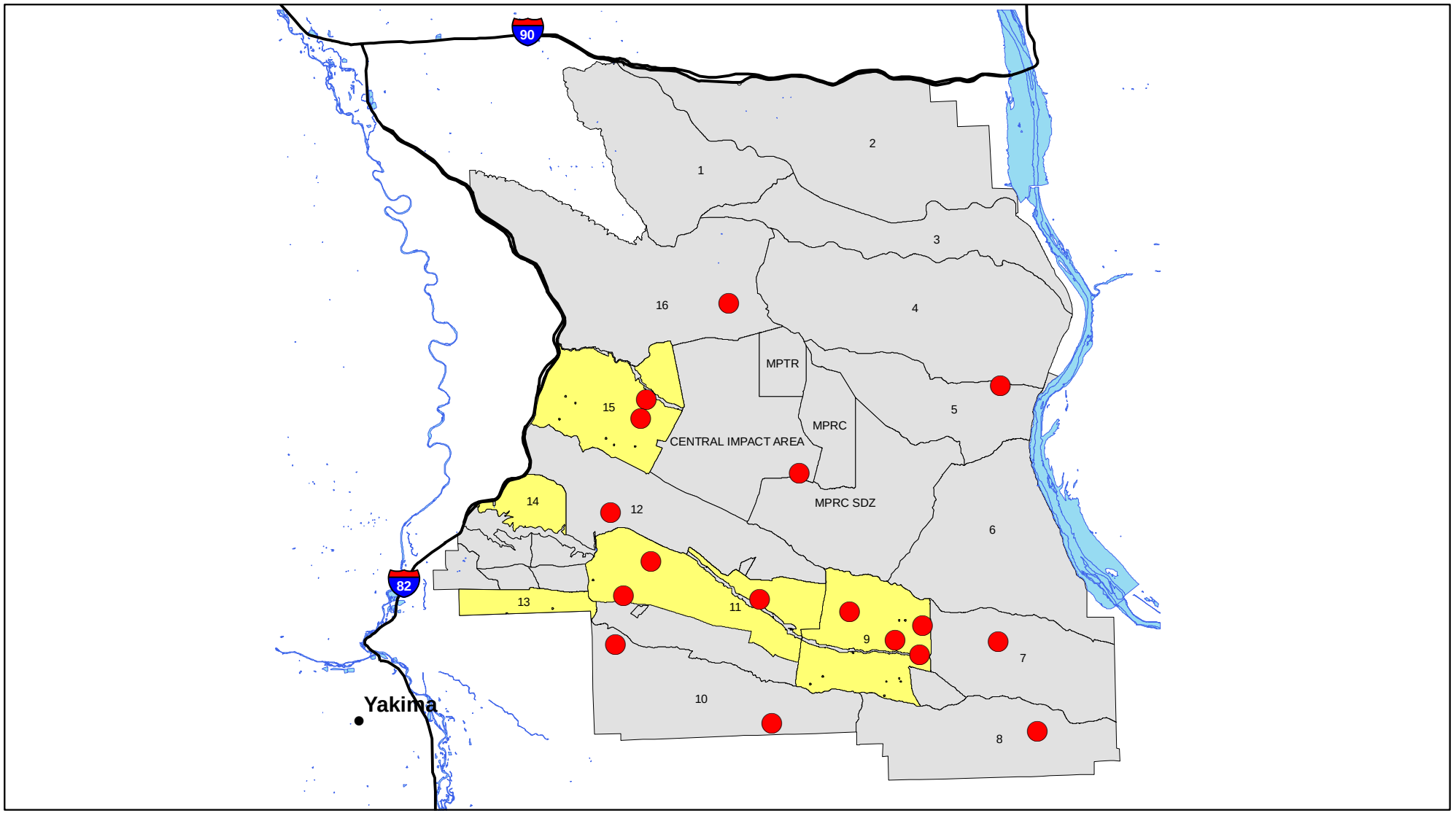
Population declines in greater sage-grouse throughout Washington have resulted from large-scale removal of native vegetation for agriculture purposes, combined with reduced habitat quality caused by intensive grazing by livestock (WDFW 1997). Sagebrush removal using herbicides and fire have also contributed to this decline. In 2004 and 2005, 43 female and 5 male greater sage-grouse from northern Nevada and southern Oregon were translocated to YTC to increase the genetic diversity of the YTC greater sage-grouse population (Livingston et al. 2006). Birds traveled about 13 miles (21 km) from the release site, on average. Approximately half of the females nested their first year after release, and about 70 percent nested during years 2 to 4 after release. More than 60 percent of these nests had at least one egg hatch.

5.3.3.3.5 Sandhill Crane

The state-endangered sandhill crane occupies wet meadows and grasslands, feeding in grain fields and pastures (Seattle Audubon Society 2008). In Washington, they nest during the summer in wetlands with emergent vegetation. During migration and in the winter, they inhabit more open areas, requiring good visibility at their surroundings. There are no nesting areas for this species on YTC, although sandhill cranes are occasionally observed on and near the installation during their migration.

5.3.3.3.6 Yellow-billed Cuckoo

The yellow-billed cuckoo is considered extirpated in Washington, but vagrant birds are very rarely seen in the state during the summer (Seattle Audubon Society 2002). Historically, yellow-billed cuckoos nested along wooded rivers in eastern Washington, as well as in various locations in western Washington. The species has not been seen on YTC, nor have there been any recent sightings of the species near the installation.



Sage-Grouse Leks

Sage-Grouse Protection Areas

0 2 4 8 12
Miles

0 4 8 16 24
Kilometers

FORT LEWIS GTA EIS

Figure 5-3
Sage-Grouse Leks and Protection Areas on Yakima Training Center

ANALYSIS AREA: Yakima & Kittitas Counties, Washington	
Date: 7/16/2009	File: Arcadis\DEIS Figures.mxd
Prepared By: KA	Layout: ProjectArea.pdf

5.3.3.3.1 Other Bird Species

Several bird species that are candidates for listing at the state level also occur on YTC. Loggerhead shrikes, sage sparrows, and sage thrashers are all summer residents of shrub-steppe habitats. These species nest in or beneath shrubs, and sage sparrow and sage thrashers are closely associated with sagebrush communities (Larsen et al. 2004). Merlins and olive-sided flycatchers sometimes utilize riparian habitats on the installation.

5.3.3.3.2 Mammals

Four mammal species that are candidates for listing occur on YTC: black-tailed and white-tailed jackrabbits, Merriam's shrew, and Townsend's ground squirrel. These species occupy burrows or shallow depressions (black-tailed jackrabbit) in sagebrush and/or grassland habitats.

5.4 WETLANDS

YTC lies in rugged topography within the Columbia Basin and averages only 6 to 16 inches (15 to 41 cm) of precipitation annually. Consequently, wetlands there are limited to the immediate vicinity of perennial streams and the numerous springs emanating from hill slopes (ENSR 1992). Major drainages include Selah Creek, Lmuma Creek (including the North Fork), Alkali Canyon, Hanson Creek, Cold Creek, Middle Canyon, and Johnson Creek. Wetlands formed in these channels (**Figure 5–1**) are composed of cattails, rushes, and sedges with occasional patches of scrub-shrub vegetation such as willows and small cottonwoods. Many of these channels have been disturbed by training activities and grazing in the past, with an overall loss of plant community structure. Erosion control programs already instituted by YTC will enhance the overall quantity and quality of riparian ecosystems found there (Army 2001b).

5.5 WILDFIRE MANAGEMENT

The potential for increased fire danger resulting from increased live-fire training use of YTC was identified as an issue during the public scoping process. Wildfire poses a significant threat to the sensitive ecosystems, cultural sites, and training lands of the Army. Army training activities require the use of munitions and weapons systems that often increase the chance of wildfire ignition and may damage important resources. The ROI covered in this analysis includes those Army-administered lands that would be affected by implementing the stationing and realignment decisions of the ROD for the 2007 GTA FPEIS, as well as the future stationing of additional CSS soldiers and a medium CAB, at YTC. Information on wildfire management provided in this section serves as baseline data for the analyses and comparison of the alternatives discussed in **Chapter 6**.

5.5.1 Wildfire Management Direction

Wildfire is an unavoidable hazard associated with certain aspects of military training at YTC, particularly during the fire danger season (May through October). YTC has established several policies and procedures to reduce or mitigate this hazard. In accordance with the September 4, 2002 Policy Memorandum issued by the Assistant Chief of Staff for Installation Management, YTC has developed an IWFMP (Nissen and Melcher 2004) for the installation. The IWFMP is the primary guidance document with respect to fire prevention, fire suppression, post-fire actions, and fire management direction for the installation.

The IWFMP establishes wildfire risks, management goals, and strategies to be used t reduce the risk of fires on the installation and improve YTC's ability to reduce fire losses. The Directorate of

Emergency Services (DES) has the responsibility for review, maintenance, and implementation of this plan. The IWFMP is reviewed annually and comprehensively updated every five years. Portions of the IWFMP that are maintained annually include pre-burn plans, annual personnel training plans, suppression water resource upgrade or development plans, annual firebreak maintenance plans, and the Fire Risk Assessment (Nissen and Melcher 2004).

The IWFMP outlines the organizational structure and responsibilities for wildfire management at YTC (Nissen and Melcher 2004):

- The Installation Commander has overall responsibility for wildfire management at YTC, including responsibilities for planning program resources, designation of the installation Wildland Fire Program Manager (WFPM), approval of the WFMP, and deployment of Army civilian firefighters to any off-installation incident.
- The Directorate of Plans, Training, Mobility and Security (DPTMS) manages all training activities; provides additional manpower support, ground equipment maintenance, and POL support; and provides coordination with military elements if additional manpower and equipment are necessary during emergency operations.
- The DES provides funding, augmentation manpower, and equipment support, as well as the development and maintenance of fire suppression resources. The DES also assists with the annual review, update, and implementation of the IWFMP.
- The YTC Fire Department, which is positioned within the DES, is responsible for all fire suppression activities at YTC. The YTC Fire Chief serves as the Installation WFPM, whose duties include development, maintenance, and implementation of the IWFMP; training and certification of all wildfire suppression staff; and development and implementation of the annual prescribed burn plan.

It is YTC's policy to suppress all wildfires on the installation, with the exceptions of those that occur in impact or dud areas and those that occur within the limits of established ranges where prior management actions have been implemented to contain fires, such as pre-burn areas. Fires occurring in impact areas are only suppressed when they threaten to escape the impact area boundary, and are only suppressed via aerial assets. However, ground suppression personnel are allowed to conduct operations along the outer perimeters of impact areas.

YTC has a current mutual aid agreement with all local upper valley fire department jurisdictions and Hanford Fire to assist with wildfire suppression requirements (ground and aerial), as well as structural fires. With this mutual aid agreement, YTC has more than 15 separate Fire Protection Districts and Municipalities that can be called upon during emergency operations (McDonald 2009g).

5.5.2 Fire History and Risk of Fire

On YTC, most fires are started by military training activities (both ground-based and from helicopters) including live-fire exercises, use of tracer rounds, explosive ordinance, and some aspects of maneuver training. These fires primarily start on existing ranges in the CIA and dud areas. While most fires are contained in these areas, there is the risk of a fire escaping and burning training areas, as well as areas surrounding the installation.

Wildfires have burned an average of approximately 9,000 acres (3,600 ha) annually for the past 25 years; however, annual burn acreages are highly variable and have ranged from 50 acres (20 ha) in 1991 to 63,296 acres (25,600 ha) in 1996 (this figure includes approximately 15,000 acres [6,100 ha] that burned off-post). High fire loss years have occurred in the last 25 years. These include 1984

(27,921 acres [11,300 ha]), 1987 (28,070 acres [11,360 ha), of which approximately 4,011 acres [1,600 ha] burned off-post), 1996 and 2003 (34,827 acres [14,100 ha], of which 146 acres [59 ha] burned off-post). Large fire loss years appear to be cyclical; during most years, between 1,500 and 6,000 acres (600 and 2,400 ha) are burned (Army 2002b, McDonald 2009g).

The risk of fire on YTC depends on several factors, including:

- Weather conditions (both seasonal weather and weather at the time of ignition). Fire risk at YTC is very responsive to the combined effects of fuel loading and moisture, temperature, humidity, and wind speed. Generally, the most extreme conditions occur between mid-day and early evening due to higher temperatures, lower humidity, and irregular afternoon winds.
- The frequency, intensity, and type of military training exercises. Pyrotechnic devices and tracers have been shown to be the most likely to ignite fires on the installation.
- The specific locations in which fires are ignited, including vegetation, terrain, and fuel loadings. On YTC, the shrub-steppe communities consist of fuel types ranging from 1- to 10-hour fuels. These are light fuels that are easily ignited and burn rapidly due to their small diameter (less than 0.5 inch [1.3 cm]). As a result, fire spreads quickly. In areas of higher disturbance, such as repeated fires and mechanical disturbance, native species have been largely out-competed by nonnative species like cheatgrass. This shift in plant communities has resulted in the development of a more fire-prone system.
- Level of response and capability of fire suppression resources to effectively attack and contain fires quickly (Army 2002b, Nissen and Melcher 2004).

Since the large-scale fire in 1996, the cumulative average of burned areas at YTC has declined due to enhancements of fire management policy related to pre-suppression and suppression activities, implementation of a risk assessment, improved suppression resources, and improved personnel training. These activities and resources are described in the following sections. According to available data, through 1996, a cumulative average of approximately 11,335 acres (4,587 ha) burned annually due to fires originating at YTC; from 1997 through 2008, this cumulative average annual acreage decreased to approximately 8,866 acres (3,588 ha) (McDonald 2009g).

5.5.3 Fire Management Areas and Activities

YTC has adopted a Fire Risk Management Assessment to evaluate the risk of starting uncontrolled fires from training activities during the fire danger season (May 15 through October 31). This assessment calculates fire risk at YTC based on values assigned to four areas:

- fire danger rating,
- military activity (i.e., the types of munitions and/or pyrotechnic devices intended for use on a given day),
- the availability and locations of fire fighting assets, and
- special considerations (e.g., status of pre-burn activities, proximity to sage-grouse habitat, time of day of the proposed training).

The fire danger rating is determined by the YTC Fire Chief and is based on meteorological information collected from a weather station located near Range Control. This weather station was upgraded in 2006 with new sensors and software and transmits data directly to the YTC Fire Station (McDonald 2009c). Data are collected and reported hourly throughout the year. The data are compiled, used to calculate and upgrade the daily fire danger value, and posted to the YTC webpage. This information is used by Range Control and YTC Fire Department personnel to implement the

Fire Risk Assessment, set daily fire danger rating (low, medium, high, and extreme), and monitor conditions during fire fighting activities and throughout the day. The Fire Risk Management Assessment is conducted throughout the day as fire danger conditions change. When the risk becomes too high, military training is curtailed or postponed until the risk of uncontrolled fire is reduced.

In addition, due to the severity and extent of the 1996 fire, YTC has developed a Pre-Incident Plan for the CIA and MPRC. Historically, fires originating in these areas have been extreme, consuming large areas rapidly. The Pre-Incident Plan establishes a fire management boundary along the Umtanum Ridge to the south of the CIA and MPRC and the Columbia River to the east. It prescribes a series of actions to be followed to contain the fire within the pre-determined fire management boundary. This plan also sets forth an annual prescribed burn plan that includes blacklining along improved roads that parallel the south and southeast boundaries of the CIA and an additional north-south route east of the CIA. Annual mechanical maintenance of the ridgeline road extending along Umtanum Ridge is another feature of the Pre-Incident Plan (Nissen and Melcher 2004).

YTC conducts annual maintenance of more than 200 miles (322 km) of firebreaks to ensure fuel breaks are strategically located to compartmentalize fires, particularly in areas where fire hazards are high (such as along the CIA boundary) and along the installation boundary. Firebreaks also provide access to remote areas of the installation for suppression teams. In addition, enhancement of the installation's road network has added more than 300 miles (483 km) of roads that act as firebreaks. Annual maintenance is conducted mechanically and through aerial application of herbicides. Chemical maintenance occurs in the fall (October) or spring (March or April), while mechanical maintenance occurs late spring through late summer. Firebreak maintenance activities are described in detail in the YTC Firebreak Maintenance Plan (Nissen and Melcher 2004, Army 2002b).

To reduce the risk of wildfires, YTC conducts prescribed burning (or, pre-burning) in areas where fires tend to recur due to training activities and in areas with a potential for fire escape. An annual prescribed burn plan is developed by the YTC Fire Department, DPTMS, and DES to identify areas and priorities for pre-burn implementation. Areas treated with prescribed burning include those in and around targetry and target movers, small impact areas (such as Ranges 7 and 8), and other small areas where there is a high probability of ignition and rapid spread or chronic recurrence exists. At YTC, prescribed burns are implemented in late spring through late summer, depending on the objectives of the burn. Early season burns reduce or eliminate fuels for the current fire season; the benefits of late season burns carry over to the following year (Nissen and Melcher 2004).

5.5.4 Firefighting Resources

All wildland fires on YTC are reported to Range Control, which dispatches and coordinates all personnel and equipment. YTC uses the Incident Command System (ICS) to maintain command and control of all emergency response scenes including wildfire suppression. ICS provides a consistent means of communication, establishes lines of authority and responsibility, and provides accountability for all personnel engaged in the suppression action. YTC's ICS is uniformly adopted by surrounding fire districts that interact with YTC Fire Department (Nissen and Melcher 2004).

There are four sources of personnel involved with wildfire suppression at YTC:

1. the YTC Fire Department, which is located in the cantonment area and includes full-time personnel dedicated to fire suppression;
2. military training units, which include personnel assigned as stand-by fire suppression crews while their units conduct training activities at YTC;
3. qualified YTC civilian firefighting staff; and
4. Mutual Aid Task Force from local fire service districts.

While military units are using ranges at YTC, they are required to designate suppression teams responsible for suppressing ignited fires. These teams are supported by YTC Fire Department personnel. Other qualified YTC civilian staff and Mutual Aid fire service districts provide support when additional ground resources are needed for emergency operations. In some cases, YTC will require training units to cease operations and assist with suppression efforts or request additional manpower and equipment from Fort Lewis (Nissen and Melcher 2004).

All personnel conducting wildfire suppression activities at YTC are trained in proper suppression procedures, fire line safety, and must satisfy initial and recurring training requirements. YTC has adopted the federal Red Card training and certification program for wildland firefighters. The YTC Fire Department provides all refresher training for YTC and military personnel to meet annual training requirements. YTC emphasizes fire prevention and control during Environmental Awareness Briefings and in the YTC Training Unit SOP. In addition, Range Control discusses fire management including the proper use of fire suppression equipment and fire suppression safety, during daily range briefings to units. Military augmentation crews receive a minimum of 3 hours of training prior to performing fire suppression activities at YTC (Army 2002b).

Both ground and aerial fire suppression equipment are used to fight wildland fires at YTC. Aerial assets are used for high-priority fires, on steep and rugged terrain, and within impact areas. In 2007, the Army modified its aerial fire suppression requirements at YTC. In this decision, the Army rescinded the specific requirement to station Chinook (CH–47) helicopters equipped with 2,000-gallon (7,600-L) water buckets at YTC during the high fire risk period. Other aircraft and water delivery systems are available that are equal to or more efficient, effective, and available to provide aerial fire suppression capabilities. This includes both internal (Army) and external (contracted services) aerial equipment. This change has given the Army greater flexibility over the types (up to 15 types) and quantity of aircraft available for aerial fire suppression, as well as the potential for more effective initial response times (15 to 45 minutes). In addition, the Army modified the period during which aerial firefighting assets are required to be stationed and available at YTC from the former requirement (April 1 through October 31) to a period that better reflects the high fire risk period at YTC (May 15 through September 30). Two optional periods (April 1 to May 14 and October 1 to October 31) could be evaluated annually based on changes in the fire season or risk (Army 2007d).

YTC uses non-potable water from ground and surface water sources for suppressing range fires. Potable water from developed wells is also available for use. Surface sources are used primarily for aerial assets, and ground sources (including developed, spring-fed fast-fill, and fast-fill wells) are used primarily for ground assets. Due to the rugged terrain at YTC, water resource availability is important throughout the training areas for both ground and aerial fire suppression resources. There are currently 24 fast-fill wells, three spring-fed fast fill wells, two fast-fill tanks (which are kept filled through water delivery by the Fire Department), and six ponds scattered around YTC for use in fire suppression activities. In addition, YTC is in the process of drilling a new well that can be used for wildfire management (McDonald 2009c). The Columbia River is also a major water source for aerial fire suppression activities.

5.6 CULTURAL RESOURCES

Baseline data on cultural resources on YTC is presented in the following sections for each resource type. The information is based on the current (2009) YTC cultural resource GIS database and previous cultural resources work completed at YTC.

5.6.1 Archaeological Resources

Approximately 280,000 acres (110,000 ha) of the 325,500 acres (131,700 ha) available for training and impact areas operations on YTC have been surveyed for archaeological resources, including the approximately 1,700 acres (690 ha) in the cantonment area. Compared to Fort Lewis, YTC has a far greater number of archaeological sites (a total of 1,353), all of which are located outside of the cantonment area.

Two archaeological districts exist on YTC: the *Wa Pai Xie* Archaeological District, which contains 11 sites, and the Tributary Headwaters Archaeological District, which contains nearly 100 sites, 10 of which are protected by a conservation easement. Both archaeological districts are eligible for listing on the NRHP. To date, 140 of the archaeological sites inventoried on YTC have been determined eligible for the NRHP.

More than 85 percent (1,180) of the archaeological sites on YTC date to the pre-contact (prehistoric) period and represent at least 10,000 years of land use. Prehistoric sites are generally found on flat terraces and benches near watercourses, at the bases of cliffs, and in the upland areas where certain plants or exposures of valued toolstone are present. Most of the prehistoric sites on YTC can be characterized as concentrations of stone tool-making debris, known as lithic scatters. The second most numerous site type is characterized as a seasonal camp or habitation site, which may have been the setting for such activities as animal butchering, fishing, plant collection and processing, or toolstone (chert, petrified wood) quarrying. Most of the camp/habitation sites are found on upland alluvial terraces north and east of the CIA, while more long-term habitation sites are found along the drainages east of the CIA closer to the Columbia River. Other archaeological resources on YTC include rock cairns and rock art (i.e., petroglyphs and pictographs).

Relatively few historic-period archaeological sites have been found on YTC, with 133 inventoried to date. All of these sites relate to homesteading, mining, railroad transportation, and ranching during the late 19th and early 20th centuries. Sites associated with the abandoned Chicago, Milwaukee, St. Paul & Pacific Railroad grade include not only infrastructure directly associated with the line (sidings, stations, workers' housing), but also evidence of construction camps. Several sites contain tent platform features with scatters of railroad-related artifacts (blasting powder cans, metal implements, coal clinker piles, etc.).

Historic agricultural and homesteading sites are related to livestock ranching and farming systems. Agricultural sites representing long-term use often contain associated buildings (including houses, barns, and various outbuildings) and structures (such as corrals, pens, cisterns, stock dams, and roads), and frequently include large accumulations of hardware and domestic trash. Ranching-related special use areas and field camps are often located on benches or terraces along perennial and seasonal streams and typically contain domestic artifacts (cookware, food tins and bottles, tableware, stove parts, etc.) and ranching tools (cattle-branding and sheep-shearing equipment, horseshoes, tacking hardware, automobile parts, etc.).

A railroad was built across the northern portion of YTC in 1908 and 1909. Several small communities served the railroad, and several sidings or "train order stations" were maintained along the line, none of which remain today. The railroad line was abandoned in the 1980s, and is now a recreational trail called the John Wayne Trail. Remnants of other historic trails that followed streams also can be found across the installation.

5.6.2 Historic Districts, Buildings, and Structures

Compared with Fort Lewis, there are relatively few historic-period buildings and structures on YTC, and no historic districts. The cantonment area contains buildings that date to the 1950s, including single-story barracks, administrative and maintenance facilities, recreational facilities, ammunition

storage structures, a water tank, and an airstrip. All of these World War II-era buildings are managed under a PA between the Army, the Advisory Council on Historic Preservation, and Washington SHPO concerning the NRHP evaluation and treatment of World War II temporary buildings. This document confirms that these types of historic military structures are not eligible for listing in the NRHP and provides a programmatic approach to their management.

5.6.3 Native American Traditional Cultural Resources

Traditional cultural resources on YTC are places and resources that are important in the ongoing traditional or spiritual practices of the Wanapum and Yakama tribes (and other area tribes). Such places include specific plant and animal habitats, natural features of the landscape, and places where important rituals were carried out in the past that continue to be used for such purposes in the present. They may not have specific geographic boundaries that can be drawn on a map, and may be known only to tribal members who wish to keep their locations and natures confidential (compare Parker and King 1998).

At the time of sustained European contact in the mid-1800s, the native inhabitants of the Columbia Plateau region where YTC is located included the Kittitas, Moses Columbia, Wanapum, and Yakama tribes (Boreson 1998). Two winter villages associated with the Wanapum people were located within the current YTC boundary: a small winter campsite at Borden Springs called *Sponse* and a winter village site at the mouth of Hanson Creek called *Wapixie*. The *Wanapum Stratsa,* a registered Wanapum Cemetery, is located along the eastern YTC boundary, and *Salhalpetcano,* a vision quest location, is in the Hog Ranch Buttes (Boreson 1998).

The Medicine Creek Treaty of 1855 identifies the area within YTC as part of the ceded lands of the Yakama Indian Nation, who retain treaty rights on their present-day reservation located 17 miles (27 km) south of YTC. The Wanapum Indian People reside in a community located near Priest Rapids adjacent to the installation's eastern boundary. Members of both tribes continue to depend upon and use areas on YTC for traditional cultural practices, such as gathering bitterroot and lomatium, which are common throughout the installation.

YTC cultural resource managers (CRMs) are aware that there are places and natural resources on the installation that have traditional cultural or ceremonial importance, and policies are in place that address access and safety for tribal members. An ongoing program of consultation with the tribes is in place to ensure accessibility and confidentiality within the parameters of the YTC mission. YTC met with the Wanapum and Yakama tribes in a NEPA public scoping meeting held in Yakima on January 22, 2009. At that meeting, no specific concerns about impacts to tribal cultural resources were expressed. YTC will continue to consult with the tribes throughout the GTA EIS process so that any adverse impacts the tribes may identify after reviewing the DEIS document can be avoided, minimized, or mitigated.

5.7 AIR QUALITY

5.7.1 Air Quality

Like Fort Lewis, YTC is in EPA Region 10; however, Yakima Regional Clean Air Agency (YRCAA) is responsible for air quality oversight in Yakima County and Washington Department of Ecology is responsible for Kittitas County. The closest PSD Class I area to YTC is the Goat Rocks Wilderness Area, which is located approximately 60 miles (96 km) to the southwest of the installation.

Air quality on YTC is generally considered good, although it can degrade rather quickly when PM pollutants are generated by rangeland fires and fugitive dust associated with maneuver training activities. However, particulate matter pollutants commonly dissipate quickly because of the predominant winds from the west/southwest. A very small strip of YTC's western cantonment area (less than 100 acres [40 ha]) lies within a maintenance area for PM_{10} (**Figure 5–4**). Therefore, this portion of the cantonment area is subject to a general conformity threshold of 100 tons per year for PM_{10} There is also a maintenance area for CO in the city of Yakima, located more than 3 miles (4.8 km) southwest of the YTC boundary. Activities at YTC are unlikely to affect air quality in this maintenance area.

Emission inventories for YTC from 1995 and 2000 showed that YTC did not generate sufficient air contaminants to require a Title V permit. The largest stationary source of air pollution at YTC is fuel-burning equipment, which includes generators, and five boilers. Three boilers have been decommissioned as of June 2009 and replaced with smaller, more fuel efficient natural gas space heater/furnaces, resulting in lower air emissions. Emissions from these sources include PM_{10}, SO_2, lead, CO, NO_x, and VOCs. Other sources of pollution include painting operations, a wastewater treatment plant, fuel storage, degreasing operations, and vehicle maintenance. Non-stationary or mobile sources of pollution on YTC generate emissions of CO, NO_x, and VOCs. Smoke generators may be used to create fog oil and graphite smoke to obscure troops during training activities. Smoke grenades, artillery shells, and pots are also used to generate smoke, and these munitions emit several hazardous air pollutants including zinc chloride, phosphoric acid, and hydrogen chloride (Army 1999, 2001d).

5.8 NOISE

Noise is generally described as unwanted sound. The physical characteristics of sound include intensity, frequency, and duration. Sound is transmitted by mechanical vibrations through different media, like air. When sound energy increases, the noise is perceived to be louder. Sound levels are typically measured using a logarithmic decibel (dB) scale.

Measurements and descriptions of sounds are usually based on various combinations of the following factors:

- The vibration frequency characteristics of the sound, measured as sound wave cycles per second (Hz) which determines the "pitch" of a sound;
- The total sound energy being radiated by a source, usually reported as a "sound power level";
- The actual air pressure changes experienced at a particular location, usually measured as a "sound pressure level"(the frequency characteristics and sound pressure level combine to determine the "loudness" of a sound at a particular location);
- The duration of a sound; and
- The changes in frequency characteristics or pressure levels through time.
- Human hearing varies in sensitivity for different sound frequencies. Human hearing is limited to frequencies between about 20 and 20,000 Hz with the upper limit generally decreasing with age. Correction factors for adjusting actual sound pressure levels to correspond with human hearing have been determined experimentally. A-Weighted correction factors are employed for measuring noise in ordinary environments and de-emphasize the very low and very high frequencies of sound in a manner similar to the response of the human ear. Therefore, the dBA is a good correlation to a human's subjective reaction to noise. To the average human ear, the apparent increase in "loudness" doubles for every 10-dBA increase in noise (Bell 1982).

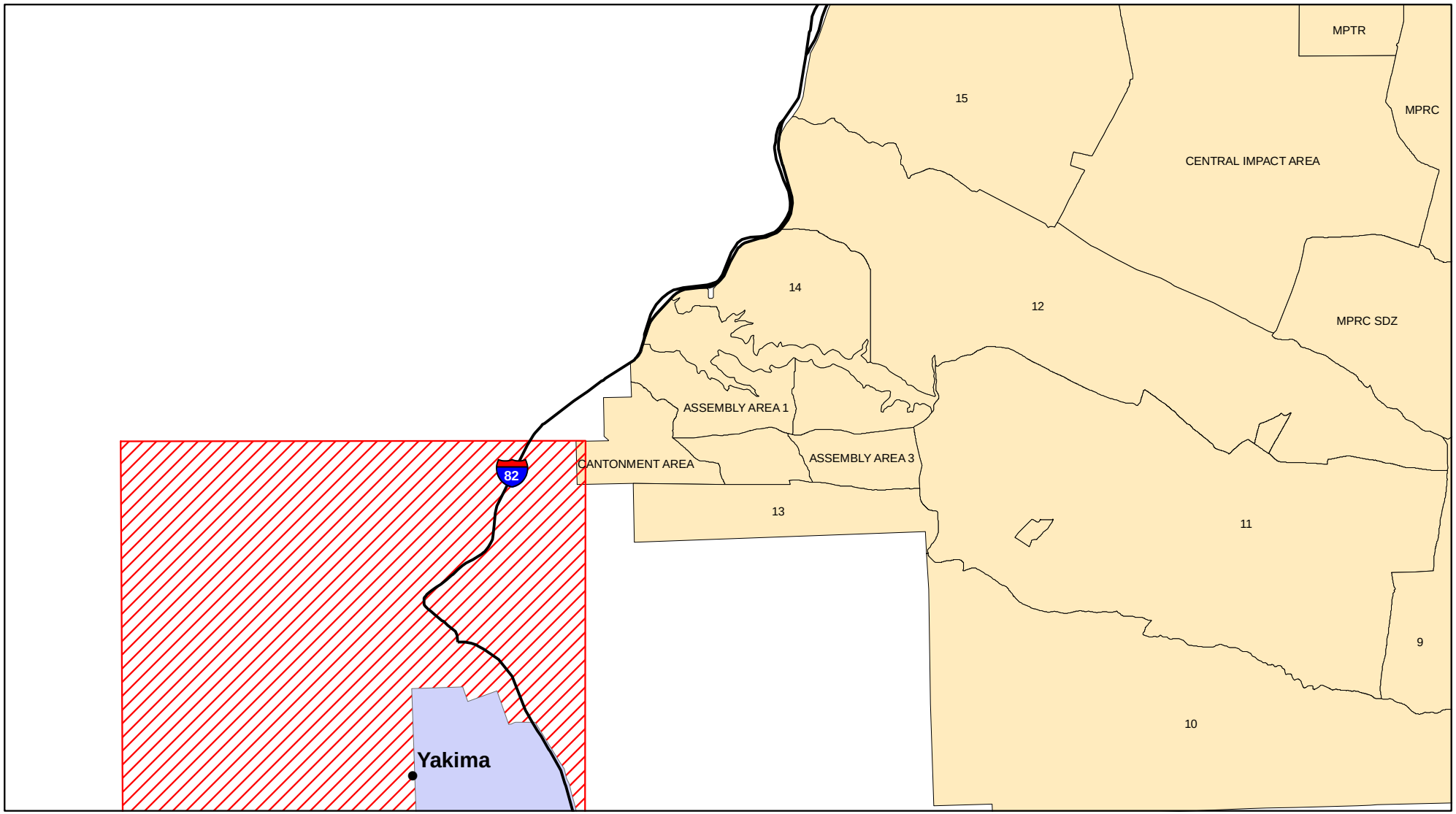


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Figure 5-4
Air Quality Maintenance Areas in the Vicinity of Yakima Training Center

ANALYSIS AREA: Yakima & Kittitas Counties, Washington	
Date: 7/16/2009	File: Arcadis\DEIS Figures.mxd
Prepared By: KA	Layout: Air Quality YTC

Although the A-weighted scale is the most widely used decibel weighting procedure, other weighting scales have been developed. The C-weighted scale and unweighted decibel values are commonly used for blast noise, sonic booms, or other low-frequency sounds capable of inducing vibrations in buildings or other structures. The C-weighted sound level is a measure read from a standard sound level meter that de-emphasizes the low and high frequencies. Additionally, evaluations of blast noise or sonic boom events sometimes use a peak overpressure measurement.

L_{eq} are used to develop single-value descriptions of average noise exposure over various periods. Such average noise exposure ratings often include additional weighting factors for potential annoyance due to time of day or other considerations. The L_{eq} data used for these average noise exposure descriptors generally are based on A-weighted sound level measurements.

L_{eq} are not an averaging of decibel values, but are based on the cumulative acoustical energy associated with the component decibel values. High dB events contribute more to the L_{eq} value than low dB events.

Peak noise events are described as L_{max}. It is the highest sound level measured over an entire noise event. Discrete noise events sometimes are characterized using the SEL. The SEL measure represents the cumulative sound exposure, intensity, and duration over an entire noise event, integrated with respect to a 1-second timeframe. SEL measurements are equivalent to the L_{eq} value of a 1-second noise event producing the same cumulative acoustic energy as the actual noise event being analyzed. In effect, an SEL measure distributes or compresses the noise event to fit a fixed 1-second time interval. SEL values can be computed using any decibel-weighting scheme.

Average noise exposure over a 24-hour period is often presented as a day-night average sound level (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises. The CDNL is used to describe the cumulative or total noise exposure during the prescribed time period. The CDNL has been found to be a good measure of annoyance noise in a community.

Ambient background noise is not evaluated in environmental noise calculations because background noise varies by location with wilderness areas being as low as 10 dBA, and because when calculating noise levels, louder sounds dominate the equation. Therefore, it is reasonable to assume that evaluation of background in calculations would have little impact on CDNL.

The Army has developed computer models that assess peak noise levels associated with random blast noise events while also factoring in the statistical variations caused by weather (USACHPPM 2008a). The noise contour plotted is PK15 (met) (unweighted peak, 15 percent metric). PK15 (met) is the peak sound level that is likely to be exceeded 15 percent of the time. Because weather conditions can cause noise levels to vary significantly, even hour to hour, the programs calculate a range of peak levels. By plotting the PK15 (met) contour, events would be expected to fall within the contours 85 percent of the time. This gives the installation a way to consider the areas affected by training noise, but without placing stipulations on land that would receive high sound levels under infrequent weather conditions that favor the propagation of sound. PK15 (met) does not consider the duration or the number of events, so the size of the contours will remain the same regardless of the number of events.

5.8.1 Department Of Defense Noise Guidelines

The DoD began developing noise evaluation programs in the early 1970s. Initial program development involved the AICUZ program for military airfields. Early application of the AICUZ

program emphasized Air Force and Navy airfields. The Army implemented the program as the ICUZ program by addressing both airfield noise issues and other major noise sources, such as weapons testing programs and firing ranges. Joint Air Force, Army, and Navy planning guidelines were issued in 1978. The 1978 guidelines use annual average L_{dn} values to categorize noise exposure conditions on military installations.

The Army has supplemented the original 1978 guidelines to develop a more comprehensive ENMP. The ENMP program incorporates ICUZ evaluations as one component. Other components of the ENMP include programs for handling noise complaints and undertaking supplemental noise evaluations when warranted by the nature of discrete noise events. Criteria for evaluation of noise levels have been expanded beyond the normal A-weighted L_{dn} descriptor to include the use of C-weighted L_{dn} values to characterize major blast noise sources. They also use peak unweighted decibel values to characterize small arms firing and large weapons training.

USACHPPM assists Army installations in developing environmental noise management plans. USACHPPM also undertakes special noise studies to evaluate noise problems associated with various types of noise sources. When investigating noise conditions related to weapons firing or ordnance detonations, USACHPPM typically measures peak unweighted decibel levels and/or C-weighted SEL levels.

5.8.2 The Army Land Use Guidelines

The Army land use guidelines identify four noise zones (USACHPPM 2008b), summarized below and on **Table 5–9**. The LUPZ DNL noise contours (60dB ADNL for aviation activity or 57 dB CDNL) represent an annual average that separates the Noise Zone II from the Noise Zone I. The contours are generated by taking all operations that occur over the year and dividing by the number of training days. The noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states “Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider” (USACHPPM 2008b). For residential land uses, depending on attitudes and other factors, a 60 ADNL or a 57 CDNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is included on the noise contour maps generated from the modeling and is included on the noise contour maps contained in this document.

Table 5–9 Land Use Planning Guidelines for Noise

Noise Zones	Aviation (ADNL)	Large Caliber Weapons (CDNL)	Small Arms Weapons PK15(met)
LUPZ	60-65	57 – 62	NA
I	<65	< 62	<87
II	65-75	62 – 70	87-104
III	>75	> 70	> 104

Source: USACHPPM 2008b

Noise Zone I includes all areas around a noise source in which the DNL is less than 65 dB ADNL for aviation activity, less than 62 dB CDNL for large caliber weapons, or less than 87 PK15 (met) for small arms weapons. This area is usually acceptable for all types of land use activities.

Noise Zone II consists of an area where the DNL is between 65 and 75 dB ADNL for aviation activity, 62 and 70 dB CDNL for large caliber weapons, or between 87 and 104 PK15 (met) for small caliber weapons. Land within Noise Zone II is usually acceptable for industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II (attributable to small arms) areas must be used for residential purposes, then NLR features of 25 to 30 decibels should be incorporated into the design and construction of new buildings to mitigate noise levels. For large caliber weapons, NLR features cannot adequately mitigate the low-frequency component of large caliber weapons noise.

Noise Zone III consists of the area around the noise source where the level is greater than 70 dB CDNL for large caliber weapons, greater than 104 PK15 (met) for small caliber weapons, or greater than 75 dB ADNL. Noise-sensitive land uses (such as housing, schools, and medical facilities) are not recommended within Noise Zone III.

Noise-sensitive land uses are acceptable within the LUPZ and Noise Zone I. They are normally not recommended in Noise Zone II and are not recommended in Noise Zone III.

5.8.3 Existing Conditions

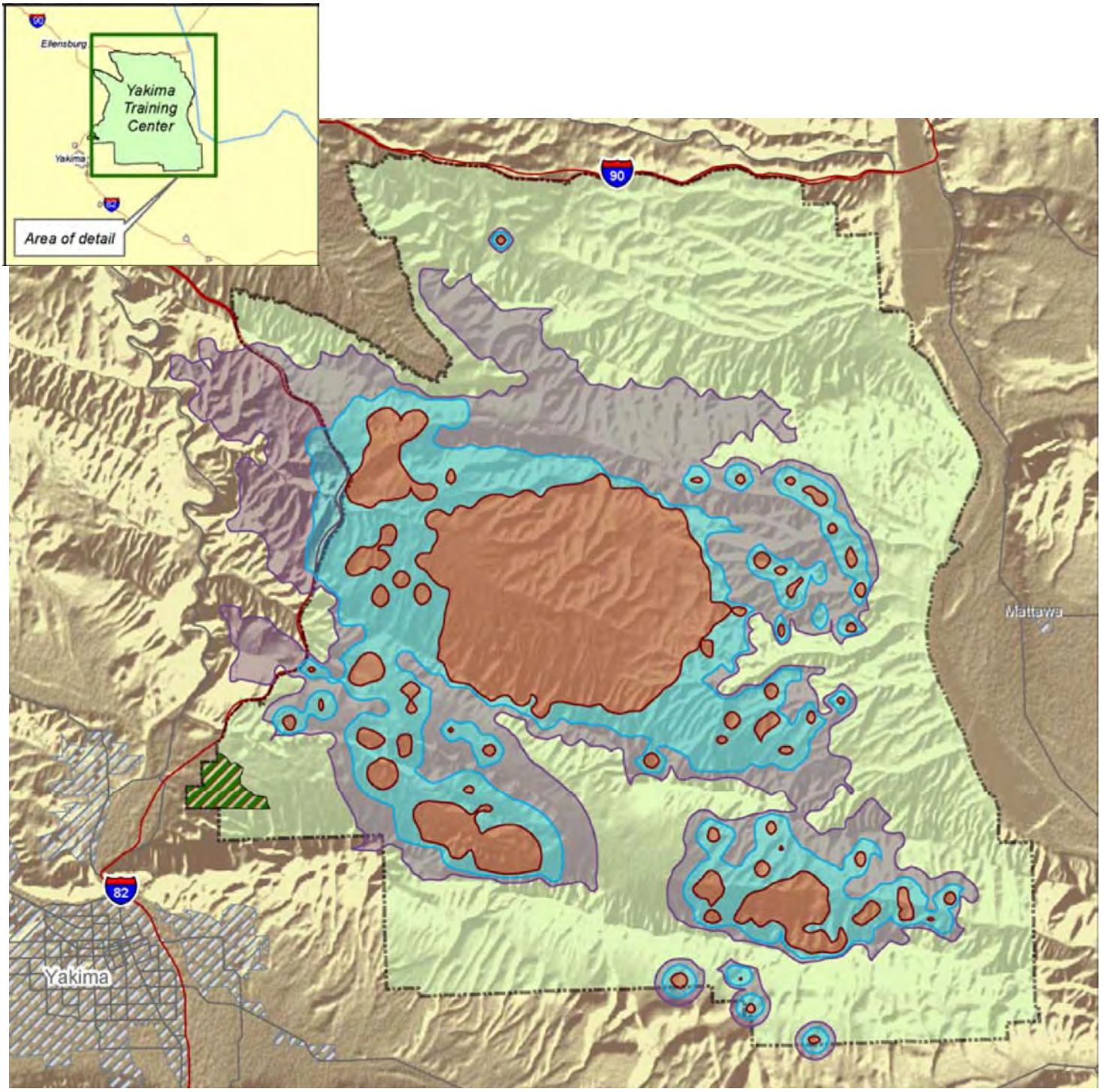
The principal users of YTC are active Army units assigned to Fort Lewis and the 81st HBCT of the Washington Army National Guard. A sub-installation of Fort Lewis, YTC is an approximate 327,200-acre training facility that supports a diverse training mission to include conventional and tactical weapons delivery, armored maneuver and live-fire, artillery (and other large caliber weapons) fire, small arms capabilities, and rotary-winged and fighter aircraft maneuver. Most of the land adjacent to YTC is zoned as undeveloped, agricultural, rural residential, and recreation land (JGA and AMEC 2007). Major communities nearby the installation include Yakima, Terrace Heights, Selah, Moxee City, Ellensburg, and the Badger Pocket Area. Occasionally, weapons firing and EOD activities are audible at nearby residential areas (Army 2007e).

Existing sources of noise at YTC include military aviation activities, small arms artillery, large caliber weapons training, and vehicular traffic. Noise from vehicular traffic is primarily located in the cantonment area. Due to the terrain, the majority of the area surrounding YTC is either uninhabited or sparsely populated. The closest town, Yakima, is approximately 3 miles southwest of YTC. **Figure 5–5** contains the baseline condition demolition and large caliber weapons noise contours for YTC. The LUPZ, (57 dB CDNL), Zone II (62 CDNL), and Zone III (70 dB CDNL) noise contours do not extend into the YTC cantonment area.

5.8.3.1 Baseline Conditions Demolition and Large Caliber Operational Noise

The baseline noise contours extend beyond the western installation boundary. The LUPZ noise contour extends up to 17,000 feet (5,300 m) beyond the boundary, the Zone II contour extends less than 4,300 feet (1,300 m) beyond the boundary, and the Zone III contour extends approximately 300 feet (100 m) beyond the boundary. The LUPZ noise contour extends approximately 2,500 feet (750 m) beyond the southwestern installation boundary. These areas are primarily mountainous and either sparsely populated or unpopulated with compatible land uses.

The baseline noise contours also extend beyond the southern installation boundary. The LUPZ noise contour extends less than 3,300 feet (1,000 m), the Zone II contour extends approximately 1,600 feet (500 m), and the Zone III less than 160 feet (50 m) beyond the boundary. The land use is zoned agricultural, is sparsely populated, and compatible with the noise environment.



Source: USACHPPM 2008a

Legend

- LUPZ (57 dB CDNL)
- Zone II (62 dB CDNL)
- Zone III (70 dB CDNL)
- Cantonment Area
- Yakima Training Center
- Interstate Highway

0 3.5 7 14
Kilometers

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Figure 5-5
Yakima Training Center Baseline Conditions Demolition and Large Caliber Operational Noise Contours

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 014

5.8.3.2 Vagabond Army Heliport

The noise contours for the baseline heliport operations are shown on **Figure 5–6**. The LUPZ (60 ADNL) and Zone II (65 ADNL) noise contours do not extend beyond the installation boundary or near existing structures. The low number of operations does not produce a Zone III (75 ADNL) noise contour.

5.8.3.3 Small Caliber Weapons Noise

The contours for small arms operations at YTC were created using PK15 (met) as prescribed in Army Regulation 200–1. The contours show the predicted peak levels for individual rounds (metric term is PK15 [met]). Because the contours are based on peak levels rather than a cumulative or average level, the size of the contours will not change if the number of rounds fired increases.

The noise contours for small arms operations near the YTC cantonment area are shown in **Figure 5–7**. The Zone III (PK15 [met] 104 dB) noise contour does not extend into the YTC cantonment area nor beyond the installation boundary. The Zone II (PK15 [met] 87 dB) does not extend into the cantonment area and extends less than 3,900 feet (1,200 m) beyond the installation boundary. Because the software cannot consider any reflection or absorption because of the terrain, the actual levels extending beyond the installation boundary may well be less than 87 dB PK15 (met).

5.8.4 Complaint Risk Guidelines for Demolition Activity and Large Caliber Weapons

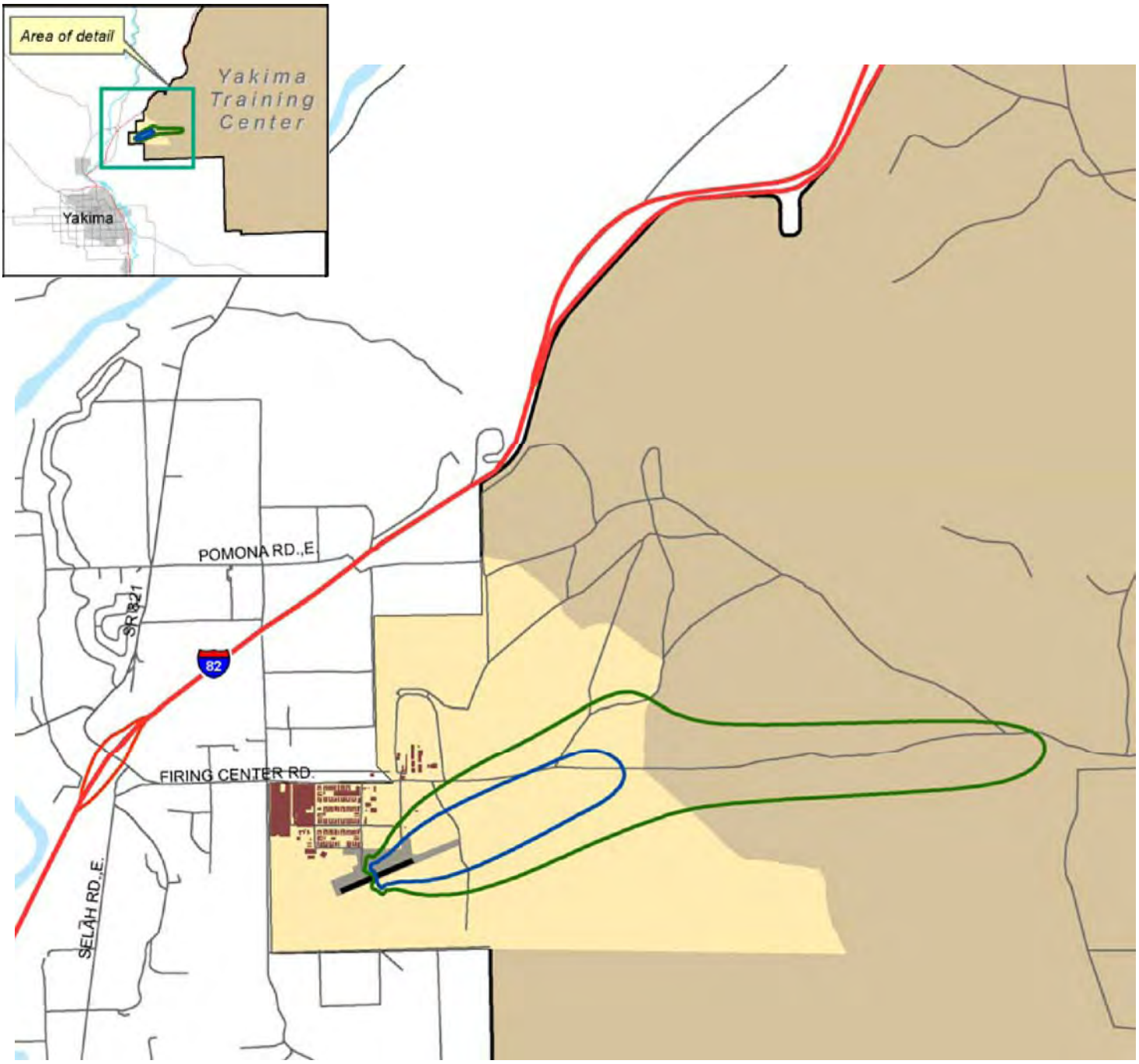
Under the Complaint Risk Guidelines, the peak contours show the expected level that one would get on a sound level meter when a weapon is fired. This metric represents the best available scientific quantification for assessing the complaint risk of large caliber weapons ranges. The complaint risk areas for PK15 (met) noise contours are defined as follows:

1) The high risk of complaint area consists of the area around the noise source in which PK15 (met) is greater than 130 dB for large caliber weapons.
2) The moderate risk of complaint area is the area where the PK15 (met) noise contour is between 115 dB and 130 dB for large caliber weapons.
3) The low risk of complaint area is the area where the PK15 (met) noise contour is less than115 dB for large caliber weapons.

The large caliber weapons baseline complaint risk noise contours for YTC are shown on **Figure 5–8**. The complaint risk contours are based on peak levels rather than a cumulative or average level; therefore, the sizes of the contours will not change if the number of rounds fired increases.

The moderate (115 dB PK15 [met]) and high (130 dB PK15 [met]) complaint risk noise contours do not extend into the YTC cantonment area. The probability of receiving noise complaints in the cantonment area is low.

The complaint risk noise contours extend beyond the western and southwestern installation boundary. The moderate risk of complaint contour extends up to 18,000 feet (5,500 m) beyond the western boundary and the high risk of complaint contour extends less than 1,600 feet (500 m) beyond the western boundary. The moderate risk of complaints contour extends approximately 2,600 feet (800 m) beyond the southwestern boundary. The complaint risk guidelines would indicate a moderate probability of receiving noise complaints resulting from demolition and large caliber activity at YTC. However, the actual risk of complaints may be low, as these areas are primarily mountainous and either sparsely populated or unpopulated.



Source: USACHPPM 2008a

Legend

- Existing Structures
- Vagabond Army Heliport
- Cantonment Area
- Yakima Training Center
- Interstate Highway
- LUPZ (60 dB ADNL)
- Zone II (65 dB ADNL)

0 .25 .5 1 Miles

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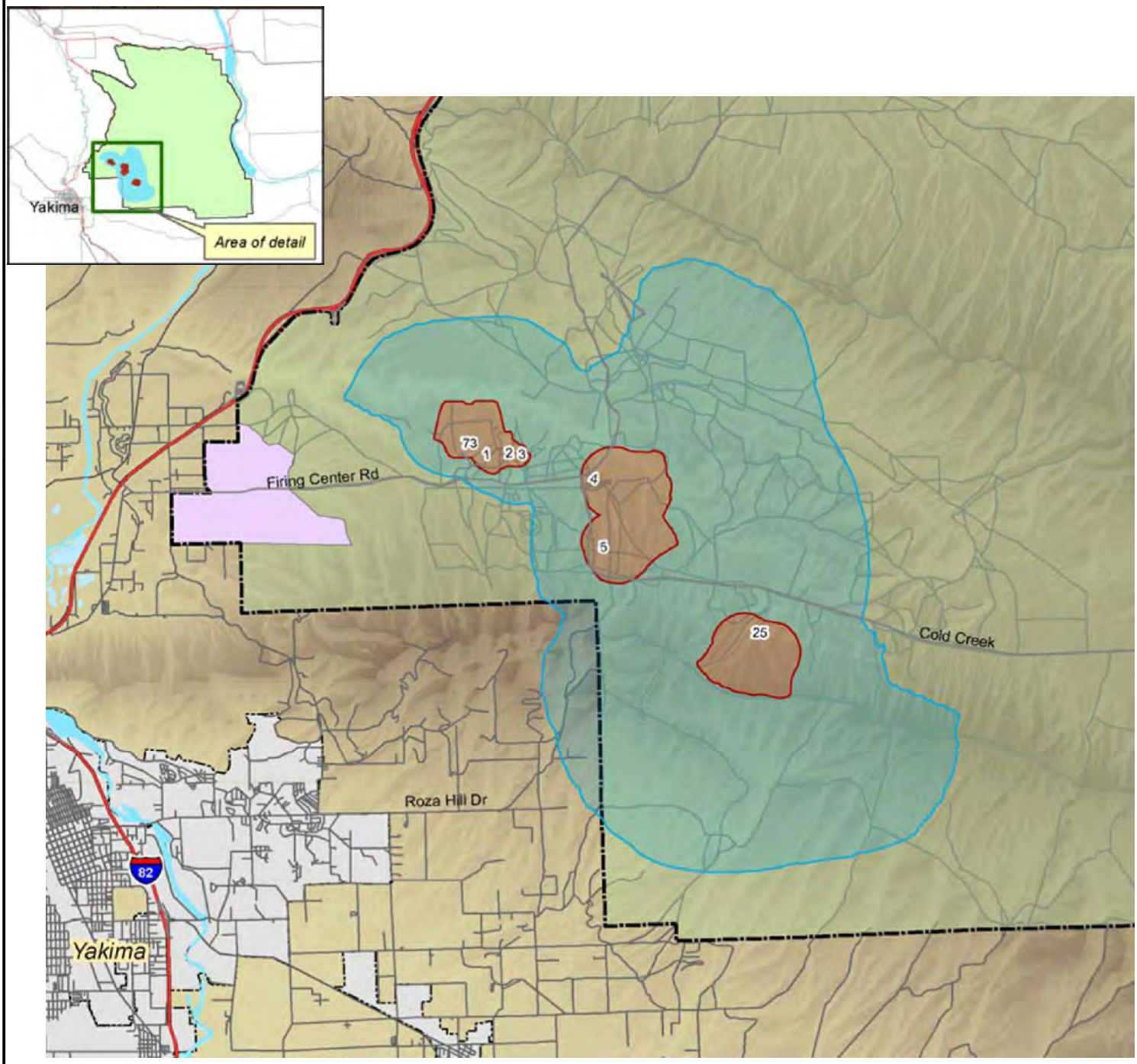
Figure 5-6
Yakima Training Center Baseline Conditions
Vagabond Army Heliport Operational
Noise Contours

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 015



Source: USACHPPM 2008

Legend

- Zone II [(87 dB PK15 (met)]
- Zone III [(104 dB PK15 (met)]
- 1 Small Arms Range Location
- Cantonment Area
- Yakima Training Center

N W E S

0 1.5 3 6
Kilometers

U.S.ARMY

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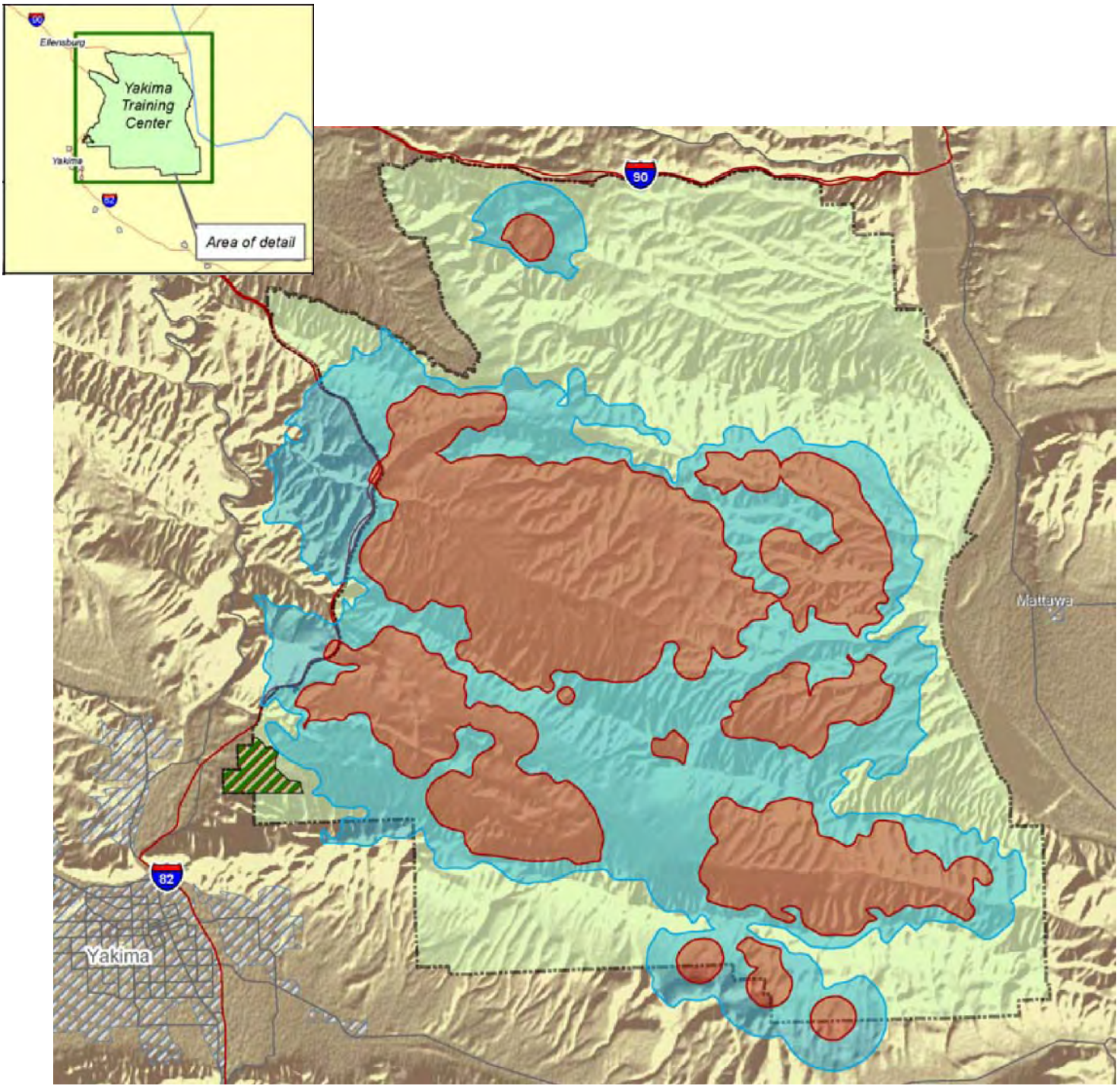
Figure 5-7
Yakima Training Center Small Arms Operational Noise Contours

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 016



Source: USACHPPM 2008a

Legend

115 dB PK15

130 dB PK15

Cantonment Area

Yakima Training Center

Interstate Highway

Complaint Risk Guidelines

Risk of Complaints	dB PK15 (met)
Low	< 115
Moderate	115 - 130
High	> 130

N W E S

0 3.75 7.5 15

Kilometers

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Figure 5-8
Yakima Training Center Demolition and Large Caliber Complaint Risk Noise Contours

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 017

The complaint risk noise contours extend beyond the southern installation boundary. The moderate risk of complaints contour extends up to 8,200 feet (2,500 m) beyond the southern installation boundary and the high risk of complaint contour extends approximately 3,000 feet (900 m) beyond this boundary. The complaint risk guidelines indicate a moderate to high probability of receiving noise complaints from the demolition and large caliber activity at YTC. The actual risk of complaints, however, may be low, because this area is primarily agricultural and sparsely populated. Finally, although noise-related inquires have occurred during the past nine years, no noise complaints have been recorded for YTC (USACHPPM 2008b).

5.9 LAND USE CONFLICT/COMPATIBILITY

The ROI for the land use conflict and compatibility analysis includes lands within YTC potentially affected by the proposed activities as well as lands adjacent to or surrounding the installation. The current land uses (including non-military uses, such as recreation); current conflict and encroachment issues; as well as pertinent federal, state, and local land use regulations, policies, and plans for the ROI, are described in the following subsections. The proposed project activities would primarily be located on land owned by the federal government. The project activities are subject to the federal authorities, but are not required to conform to state, county, municipal, or other plans and policies or related land use documents.

The following issue relating to land use conflict/compatibility at YTC was identified during public scoping. This issue is addressed in the following sections for each alternative.

- Temporary and permanent land use effects from implementing GTA actions.

As discussed in **Section 3.9**, planners divided Fort Lewis and YTC into geographically distinct districts and then created ADPs to address the unique mission and facility requirements for each geographic area on Fort Lewis and YTC.In the case of YTC, a single ADP has been developed, which focuses primarily on the cantonment area.

Major land uses at YTC include the cantonment area (approximately 1,700 acres [690 ha]), which includes residential, administrative, commercial, light industrial, and open space uses; training and impact areas (327,200 acres [132,400 ha]), which include maneuver, impact, range, and special uses; and the Selah Airstrip and VAH (291,951 acres [118,148 ha]).

The primary users of YTC are the various units stationed at Fort Lewis and National Guard and Army Reserve units from Oregon and Washington. YTC offers the acreage for training that Fort Lewis lacks, and supports the larger organizational unit (e.g., brigade level) and weaponry training not possible at Fort Lewis or other military installations in the Pacific Northwest.

5.9.1 Cantonment Area

The cantonment area serves as the administrative center for most training activities at YTC, except for range management, which is located at Range Control. Residential areas include permanent bachelor officer quarters. Administrative areas house buildings for offices, headquarters, classrooms, and other administrative functions. Commercial uses are limited to the Post Exchange and restaurant/ club uses. Light industrial uses include warehousing, motor pool, and maintenance shops. Recreational uses include the recreation club and gymnasium, Kiddie Pond, and open space.

5.9.2 Training Areas

Training areas at YTC include hilly desert and riparian environments. They are delineated into maneuver, impact, range, and special use areas. Special use areas include airborne training sites

(drop zones), ammunition storage, and equipment storage. Training activities on maneuver areas that characterize land use at YTC include maneuver events, off-road tracked vehicle movement, wheeled vehicle movement, aerial maneuver and gunnery activities, gunnery practice, digging activities (tank ditches, vehicle positions, and foxholes), unit assembly areas, and river crossing exercises.

The designated training areas are established to facilitate range management. Their use is managed by Range Control. Training activities are coordinated to preclude damage to sensitive habitats and species. In conjunction with Range Control, this coordination occurs with the ENRD at YTC.

5.9.3 Recreation and other Non-military Uses

Non-military land uses at YTC include recreational activities such as hunting, hiking, and horseback riding. These activities may take place anywhere throughout non-restricted areas of YTC, depending on scheduled training exercises and when approved by the YTC Commander. Between 1981 and 1984, the State of Washington Parks Department acquired the railroad right-of-way now known as the John Wayne Trail. Twenty-two miles of this trail are located within, and owned and managed by, YTC. The trail is used for non-motorized types of recreation including hiking, trail rides, bicycling, and horseback riding. A livestock grazing program existed at YTC from 1960 to 1995. Additional requirements placed upon natural resources from training and increased resource conflicts prompted termination of this program in December 1995.

5.9.3.1 Tribal Access

YTC is within the area ceded by bands and tribes of the Yakama Nation pursuant to the Treaty of 1855. Yakama tribal members continue to hunt and gather plant resources at YTC. The Wanapum People live adjacent to YTC's eastern boundary near Priest Rapids Dam and use the installation for traditional, religious, and ceremonial purposes. Restricted areas of YTC (e.g., impact and dud areas) are not open to the public or for tribal access. Numerous areas of YTC support root crop plants important to Native Americans. Bitterroot and several species of lomatium are especially sought. These plants are common in all complexes. Use of YTC by Native Americans is discussed in detail in **Section 5.6**.

5.9.3.2 Resource Management Land Use Zones

To aid in resource management, YTC is divided into five land use zones. These planning designations identify allowable military training activities and acceptable levels of impact to resources, thereby maximizing military training opportunities while simultaneously safeguarding resources. Land use and management activities are undertaken within the context of the zone designation. The following are descriptions of the five existing land use zone designations at YTC:

- Zone 1 (Land Bank). This zone covers approximately 10,000 acres (4,046 ha or 3 percent) of YTC. It is managed for significant and sensitive natural and/or cultural resources (e.g., wetlands, riparian areas, archaeological, or sacred sites). Most forms of training, including all tracked and wheeled vehicle use, digging, and bivouacking, are prohibited in this zone. Protection and restoration of these sites is a primary management objective.
- Zone 2 (Conservation). This zone is the Sage-grouse Protection Area and covers approximately 44,300 acres (17,900 ha or 13.5 percent) of YTC. Most forms of training are permitted within these areas, but are highly controlled. The Sage-grouse Management Plan provides a detailed description of protection and management measures that apply to these areas. Digging and bivouacking activities are not permitted within this zone. Army rest/rotation training regimes and restoration or rehabilitation activities are designed to maintain or enhance these areas.

- Zone 3 (General Use). This zone covers approximately 246,000 acres (99,600 ha or 75 percent) of YTC and includes the MPRC, Multi-purpose Training Range (MPTR), cantonment area, and all the primary training and vehicle maneuver areas. With the exception of the cantonment area and portions of the MPRC and MPTR, all forms of training are permitted, including bivouac and digging activity, as long as surface water quality, soil stabilization, and potential long-term habitat reservoirs are maintained.
- Zone 4 (High Use). This zone covers approximately 7,750 acres (3,140 ha or 2.4 percent) of YTC. It accommodates heavy use and high-impact activities, such as Brigade Support Areas (BSAs) and gravel pits. Reclamation or remediation activities are used to ensure protection of soil and water resources.
- Zone 5 (Impact Areas). This zone covers approximately 19,100 acres (7,730 ha or 5.8 percent) of YTC and includes impact and dud areas and the Selah Airstrip. Due to unexploded ordnance in impact and dud areas, these sites are off limits; on-the-ground management of these sites is not feasible other than the protection of soil and water resources. These sites are, however, included in remotely sensed data collection efforts, including as subjects to satellite imagery and aerial photographs.

5.9.3.3 Land Uses Surrounding Yakima Training Center

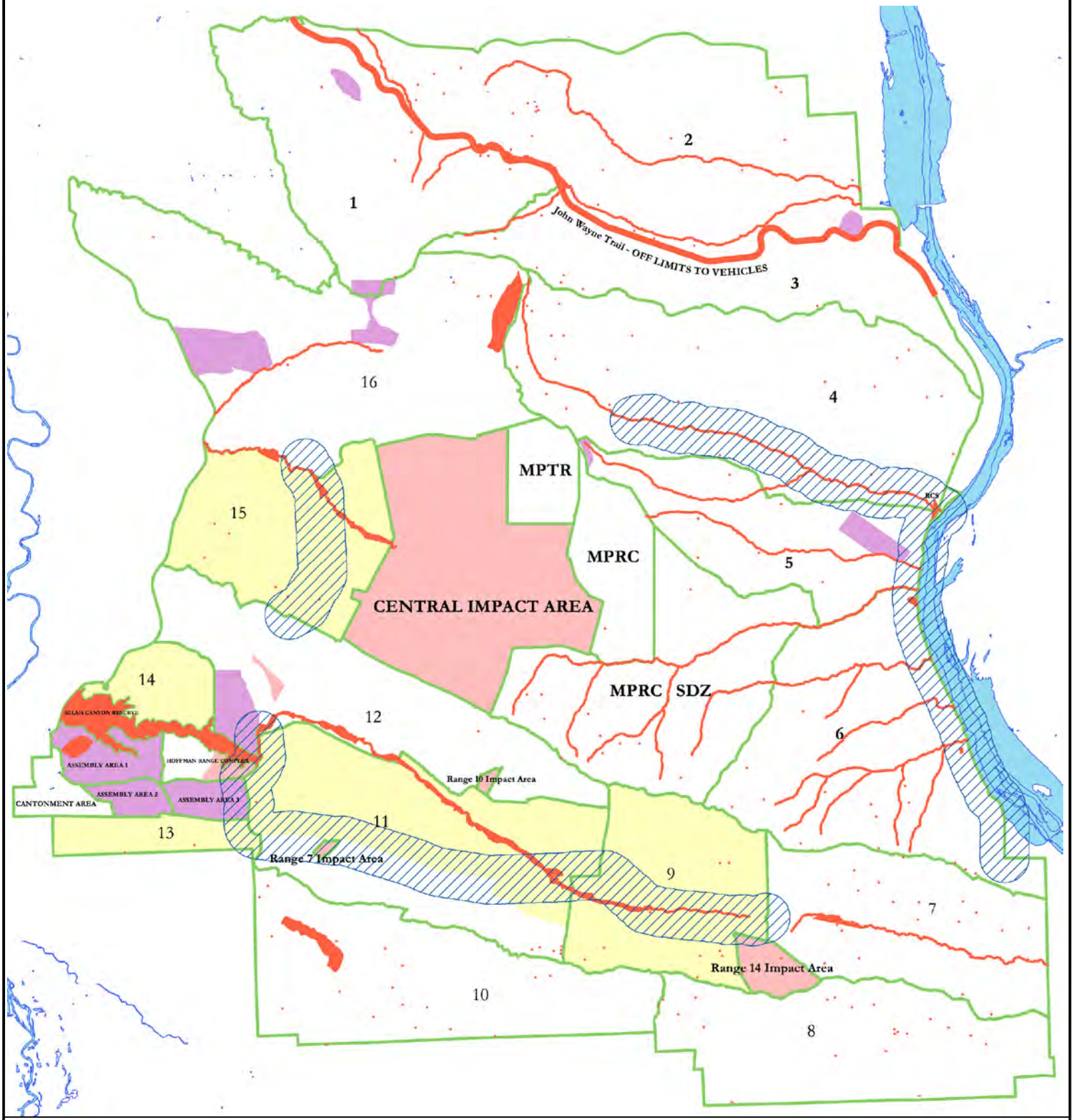
YTC is bounded to the north by I–90, to the east by the Columbia River, to the south by open land and SR 24, and to the west by I–82. YTC is bordered on the west and southwest by suburban residential development. Other land adjacent to YTC is used for agriculture, livestock grazing, and recreation, and includes ranges and residential areas, as well as various federal- and state-owned parcels.

Figure 5–9 shows the significant land use features for YTC. The area north of I–90 contains a patchwork of private and government-owned land used primarily for grazing. There are two wind projects north of YTC's northern boundary. Puget Sound Energy's 230 MW Wild Horse Wind Project, located 15 miles (24 km) east of Ellensburg, is currently operational and includes 127 turbines on 8,600 acres (3,500 ha). The Vantage Wind Project is being built by Invenergy Wind North America, LLC at a location 18 miles (29 km) east of Ellensburg, between I–90 and Vantage Highway. The project includes 69 turbines on 4,750 acres (1,920 ha). Construction on the Vantage Wind Project was scheduled to begin in March 2009. Gingko State Park and Wanapum State Park border YTC at its northeast corner. Several small communities are located within the larger area beyond the Columbia River to the east, which is used primarily for open grazing. Toward the southern end of YTC's eastern border, the Wanapum People live in a small village near Priest Rapids Dam, immediately adjacent to the installation boundary. The south slope of Yakima Ridge, at and beyond the southern installation boundary, is used primarily for livestock grazing and agriculture. Several urban and smaller residential communities, including Yakima, Selah, Moxee City, and Terrace Heights, are located at YTC's southwest corner. I–82 separates the western boundary of YTC from the L. T. Murray Wildlife Recreation Area.

Finally, the area extending into YTC boundaries at its northwest corner, referred to as the Badger Pocket, consists of irrigated agricultural land with scattered residences and farm buildings.

5.9.4 Yakima Training Center Airspace Use

Helicopter and fixed-wing aircraft operations are conducted at YTC. Operations are centered on VAH, Selah Airstrip, and the live fire ranges and training areas and are conducted in support of training activities. Airspace use is discussed in **Section 5.13**.



Legend

- Zone 1 - No Vehicles or Digging
- Zone 2 - Sage Grouse Protection Area
- Zone 3 - General Use Area
- Zone 4 - Bivouac Location (BSA)
- Zone 5 - Off Limits Area
- Seasonal Flight Restrictions

0 10,000 20,000 40,000
Feet

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Figure 5-9
Land Use Zones Surrounding the Yakima Training Center

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date:7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 025

5.10 TRAFFIC AND TRANSPORTATION

5.10.1 Study Area and Roadways

Figure 5–10 is a vicinity map showing the location of the approximate 327,200-acre (132,400 ha) (roughly 511-square mile) YTC and the surrounding region in Yakima County. YTC and the nearby City of Yakima, with its surrounding suburban communities, are accessed via I–82, the major north-south interstate freeway in the area. Near the training center, I–82 is a divided freeway and has two travel lanes in each direction.

Figure 5–11 shows the associated roadway network adjacent to and within the main post area of YTC. From I–82, two routes are available to access YTC. The primary access is via Firing Center Road (Exit #26), which is the main ACP onto the post. The second access from the Military Road exit (Exit #11) provides an entry point for military convoys; otherwise, it is typically gated and locked. Additionally, access onto YTC is available via E. Pomona Road. However, this access is not used unless freight is brought in by rail. At other times, it remains gated and locked. E. Pomona Road crosses I–82, but does not access the interstate. Another secondary access is from Huntzinger Road on the east side of the post.

If Exit #26 is closed, Exit #29 at E. Selah Road, which runs parallel to I–82 and leads north to Firing Center Road, may be used.

5.10.2 Existing Population and Traffic Volumes

There are about 550 full-time civilian, military, and contractors currently working at YTC. There is no on-post housing; therefore, the post employees, Soldiers, and their Families live off-post in the Yakima Valley area, with Selah, Yakima, Naches, and Ellensburg being the leading residential areas. YTC has supported maneuvers and training involving more than 15,000 troops in the past. However, the installation is currently providing training for an average of 2,200 Soldiers. Presently, fixed barracks are available as temporary housing for 2,500 personnel.

Figure 5–11 also shows the existing AM and PM peak hour and average weekday traffic volumes on the pertinent roads associated with YTC. These counts were provided by Yakima County Public Works staff, and where taken in June 2007. According to these data, Firing Center Road has the highest volume of vehicles (2,533 vehicles) during an average weekday. All of the other roads experience relatively low traffic volumes. Copies of the traffic volume count summary sheets are attached in the Transportation Study Report (Fehr and Peers 2009).

On I–82, the WSDOT *2007 Annual Traffic Report* shows an average of approximately 16,000 vehicles per day counted in 2007 just north of the Firing Center Road exit (Exit #26). At milepost 27.12, just south of the I–82/Firing Center Road ramps, approximately 18,000 vehicles per day were counted in 2006. The pertinent WSDOT volume data are also provided in the Transportation Study Report (Fehr and Peers 2009).

5.10.3 Gate Operations and Traffic Volumes

YTC's Main ACP (gate) is located on Firing Center Road just east of Pomona Heights Road. **Figure 5–11** shows that, just east of Pomona Heights Road, there was an average of 135 vehicles entering and exiting the post during the 0700 to 0800 AM peak hour in June 2007. Thirty-nine vehicles were counted during the PM peak hour, which is shown to be from 1500 to 1600. During an average weekday, 810 vehicles in total were counted at this location.

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Figure 5-10
Yakima Training Center Vicinity Map

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 023

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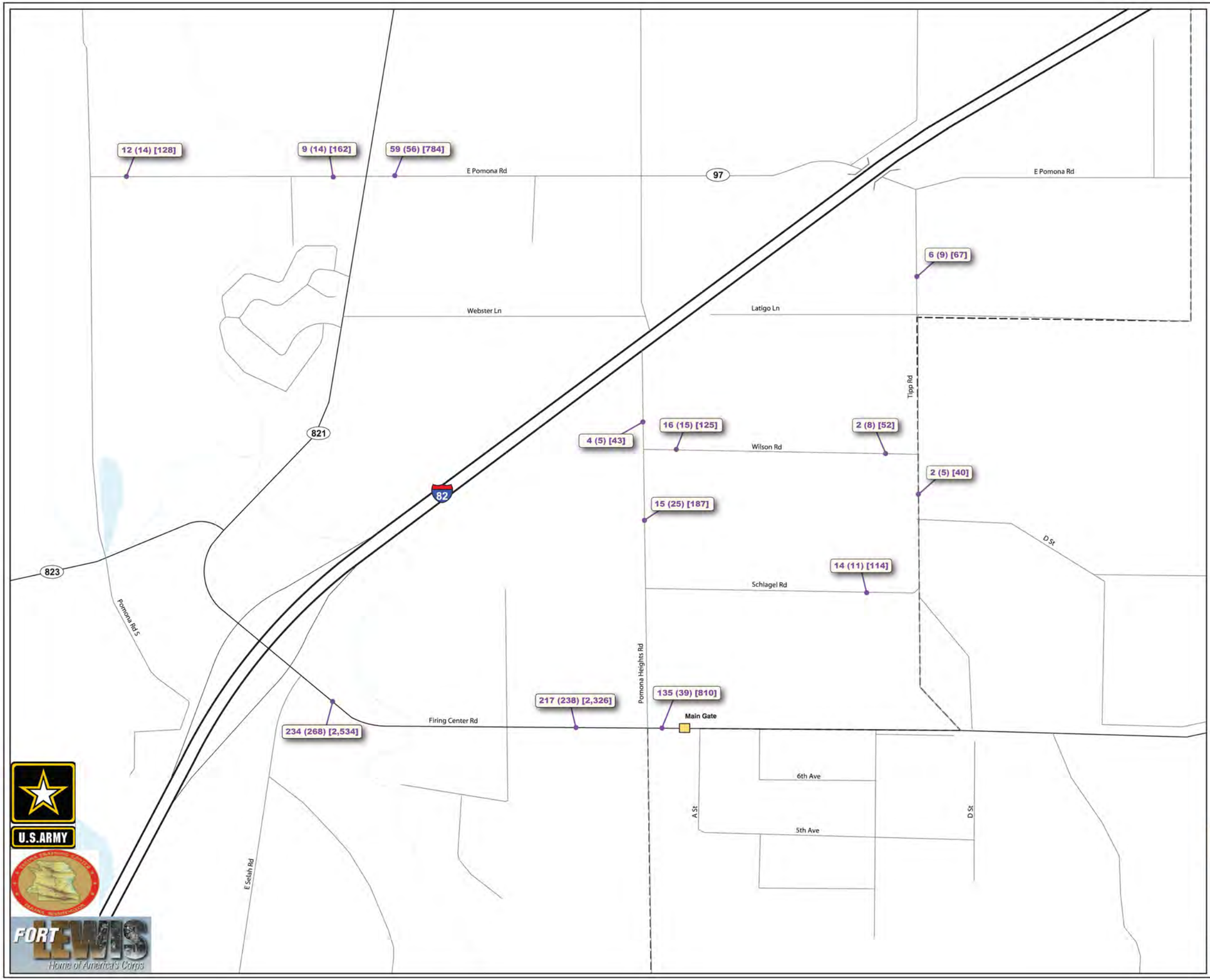

Legend

- AM (PM) [Avg Wkdy] — Peak Hour & Average Weekday Traffic Volume
- Installation Boundary
- Access Control Point (Gate)

Note:
AM Peak Hour is from approximately 0700 - 0800. PM Peak Hour is from approximately 1600 - 1700.

All counts taken in June 2007.

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Figure 5-11
Yakima Training Center
2007 Volumes

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: fig5-11_ytc_2007_vols.dwg
Prepared By: TR	Layout: fig5-11_ytc_2007_vols.pdf

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YTC's Main ACP has one lane operating in each direction (one entering/one exiting). Because there is only one entering lane, queues and wait times are sometimes relatively long when entering the post. This has been reported to be the case, primarily due to large military convoys or if there are several commercial trucks entering the post.

5.11 SOCIOECONOMICS

This section describes the affected environment to the following:

- Demographics
- Housing
- Economic development
- Public finance
- Quality of life
- Environmental justice in minority and low-income populations
- Protection of children from environmental health risks and safety risks

The ROI for YTC comprises Kittitas and Yakima Counties. YTC, at which some construction activity and some additional training activities would occur, is located in both Kittitas and Yakima Counties; the cantonment area is located in Yakima County. The City of Ellensburg is located north of YTC; the City of Yakima is located to the south. The Counties of Kittitas and Yakima represent the functional economic region for YTC.

5.11.1 Demographics

5.11.1.1 Region of Interest

The estimated population of the ROI totaled 275,300 in April 2008, an increase of more than 7.5 percent since 2000. There are two large communities located in the ROI near YTC: the City of Ellensburg, located north of YTC, with an estimated population of 17,330 in 2008; and the City of Yakima, located to the southwest of YTC, with an estimated population of 84,300 (Washington Office of Financial Management 2008a).

Approximately 320 civilian workers are employed at YTC (Army 2008a). Assuming each is a head of household, this would represent a population of approximately 832 persons (applying an average household size of 2.6 as contained in the 2000 Census [U.S. Census Bureau 2000]). The 124 active duty military personnel at YTC are accompanied by approximately 188 Family members, which results in a total connected population of about 1,144 persons, or approximately 0.4 percent of the entire 2008 population of the ROI.

5.11.1.2 Housing

5.11.1.2.1 On-Post

YTC has no on-post housing units for either unaccompanied or accompanied personnel stationed there. All military personnel reside in surrounding communities. Approximately 2,500 barracks spaces are available to house Soldiers during training exercises (Morey 2008).

5.11.1.2.2 Off-Post

An estimated 101,016 housing units are located in the ROI (U.S. Census Bureau 2008a). The proportion of owner-occupied housing units is 58.3 percent.

Due to the small military population at YTC, a comprehensive housing market analysis for the area has not been conducted. The off-post population in the YTC market area (within 20 miles [32 km] of YTC's cantonment area) is estimated at greater than 80,773; many communities within 20 miles (32 km) of the cantonment area are in unincorporated parts of Yakima County for which population data are not available. The population of Yakima County as a whole has increased at an average rate of approximately 0.7 percent since 2000; population growth increased at an average rate of 1.8 percent per year from 1990 to 2000. The annual growth rate is projected to increase to 1.6 percent through 2012, resulting in an estimated population in 2012 of 251,555 (Washington Office of Financial Management 2007).

Vacancy rates and rentals within the ROI appear to be fairly stable over time. The rental vacancy rate was reported as 6.8 percent in 2007 (U.S. Census Bureau 2008b); this is higher than reported during the 2000 Census, but lower than some general estimates of approximately a 10 percent vacancy rate (Yakima Valley Development Council 2008). Less than 2 percent of the occupied housing is reported to lack full plumbing or kitchen facilities.

5.11.1.3 Economic Development

Characteristics of economic development include employment and its distribution across industrial sectors, unemployment, earnings and sources of income, and the contribution made to the regional economy by the military installations, their personnel, and retired service members.

5.11.1.3.1 Employment

In 2006, there were more than 3.8 million jobs in the State of Washington, of which about 146,380 were military and federal/civilian jobs (Bureau of Economic Analysis 2008a). Approximately 113,000 people were employed in the ROI in 2007, 87.8 percent of whom worked in Yakima County (Bureau of Labor Statistics 2007). In Yakima County, the largest share of employment is concentrated in local government, with 12.8 percent of jobs. The health care industry employed 12.4 percent, the retail trade sector employed 9.6 percent, and manufacturing accounted for an 8.8 percent share. (Washington Office of Financial Management 2008b) The largest employer in Yakima County is the Yakima Valley Memorial Hospital; YTC ranks as the 13th largest employer in the county (Yakima County Development Association 2008).

The unemployment rate in both counties of the ROI gradually increased from lows of between 5.5 percent (Kittitas County) and 7.6 percent (Yakima County) in 2000 to highs of 7.7 and 9.6 percent, respectively, in 2003. The unemployment rates in both counties then dropped consistently to 4.8 percent and 6.3 percent, respectively, in 2007. Preliminary data suggest that average unemployment in both counties for 2008 will be higher than in 2007. Unemployment in both counties is cyclical, with higher unemployment during the winter months and lower unemployment during the harvest season (Bureau of Labor Statistics 2008).

5.11.1.3.2 Earnings and Income

Total non-farm wage and salary earnings in the ROI totaled just more than $6.6 billion in 2006, approximately 85 percent of which was contributed by Yakima County (Bureau of Economic Analysis 2008a). The contribution to total earnings by the military sector is higher in Kittitas County (approximately 0.6 percent) compared to 0.5 percent for Yakima County; the contribution in both counties is lower than for the state as a whole (approximately 2.4 percent (Bureau of Economic Analysis 2008b).

5.11.1.3.3 Military Activities

YTC is the only major military installation within the ROI. The National Security Agency operates the Yakima Research Station at YTC. Though small, YTC is important to the health and stability of the local economy and supports businesses and jobs through 1) payroll expenditures by military and civilian personnel, 2) direct procurement of goods and services by the installations for operations and maintenance functions, and 3) government contract awards to private firms located in the region.

5.11.1.3.3.1 Personnel (Active Duty and Civilian)

Personal income associated with the military totaled $36.7 million in 2006 in Kittitas and Yakima Counties combined.

In 2007, the Army awarded approximately $9.12 million in prime contracts to firms located in Kittitas and Yakima Counties.

The total YTC-related population in FY 2009 is approximately 1,144 (Army 2008a).

5.11.1.3.3.2 Payroll

Wages paid to personnel (active duty and civilian) at YTC totaled approximately $32 million in 2007 (J. Reddick, as quoted in Morey 2008).

5.11.1.3.3.3 Procurements

Expenditures on grants and contracts by the installation can vary measurably from year to year. The value of grants and contracts let by the Army in FY2006 in Kittitas and Yakima Counties, as reported by the DoD, was $9.12 million (DoD 2008). The large majority (more than 99 percent) of DoD prime contracts awarded to firms in the ROI have been made to companies located in Yakima County; these account for approximately 1.5 percent of all DoD awards statewide.

5.11.1.3.3.4 Multiplier Effects

The injection of funds into a regional economy has what is referred to as a direct effect. This spending creates a demand for goods and services that, in turn, increases output and employment in numerous support industries. This is referred to as the induced effect, and the link between the two is the multiplier effect.

5.11.1.4 Public Finance

The primary sources of revenue for Yakima County include real and personal property taxes, sales taxes, transfers from the state government, and investment income. The primary sources of revenue for Kittitas County include real and personal property taxes, sales taxes, intergovernmental transfers, and licenses and permits.

The major operating expenditure categories for Yakima County include public safety, general government, and justice services. The major operating expenditure categories for Kittitas County include public safety, justice services, and community development services.

5.11.1.5 Quality of Life

5.11.1.5.1 On-Post

Numerous facilities and services located at YTC contribute to the quality of life of military and civilian personnel and their families residing off-post. These include the Post Exchange, barbershop, recreation center, gymnasium, and chapel.

5.11.1.5.1.1 Child Care

There are currently no childcare facilities or programs at YTC.

5.11.1.5.1.2 Health Care

There are no health care or medical facilities at YTC beyond those necessary to provide emergency care to Soldiers training at the Center. Soldiers requiring care beyond the basic or emergency care available at YTC travel to MAMC at Fort Lewis.

5.11.1.5.1.3 Public Schools

There are no schools at YTC.

5.11.1.5.1.4 Other Facilities

There are a number of on-post facilities including the Post Exchange, barbershop, recreation center, gym, chapel, mailroom, and The Firing Point Community Center.

5.11.1.5.2 Off-Post

The communities that surround YTC provide numerous recreational, medical, retail, food, and other community services and facilities. Of the wide array of off-post services and facilities, public schools are highly important.

5.11.1.5.2.1 Community Public Schools

There are 21 school districts in the ROI with a total combined student enrollment in 2008 of 55,245 (Washington Office of Superintendent of Public Instruction 2008). Personnel assigned to YTC may reside throughout the ROI; due to the small number of military and civilian workers at YTC, their children do not constitute a noticeable portion of the student membership in any school district.

5.11.1.6 Environmental Justice

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires each federal agency to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations.

Environmental Justice: Guidance Under NEPA defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic (CEQ 1997). According to the guidance, a minority population should be identified where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.

The percentages of minority populations within the ROI are approximately 10.6 percent in Kittitas County and 43.5 percent in Yakima County (U.S. Census Bureau 2000). The population of the census tracts including and immediately adjacent to YTC had a lower percentage of minority population than across Yakima County as a whole. Of the total U.S. Military, 27 percent of active duty members identify themselves as minorities (Army 2007a).

Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. For example, the poverty threshold for a family of four with two children was $17,463 in 2000 and rose to $21,200 by 2008 (Department of Health and Human Services 2008), the proportion of people in poverty was 11.3 percent in 2000 and 12.5 percent in 2007. Both Kittitas and Yakima Counties have poverty levels that exceed or are equivalent to 20 percent: 24.3 percent in Kittitas County and 20.7 percent in Yakima County (U.S. Census Bureau 2008a).

The U.S. Census Bureau defines a "poverty area" as a census tract or block numbering area where 20 percent or more of the residents have incomes below the poverty threshold (U.S. Census Bureau 2008c). The 2000 Census indicates that there were three "poverty areas" in Kittitas County, and that 15 of 34 Census Tracts in Yakima County met the definition of a "poverty area."

5.11.1.7 Protection of Children

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," seeks to protect children from disproportionately incurring environmental health or safety risks that might arise from, government policies, programs, activities, and standards.

There are no children regularly present at YTC at this time. However, a Child Development Center is a planned future facility in YTC's ADP, which means that children will be regularly present at YTC in the future.

5.12 HAZARDOUS MATERIALS AND WASTES

During public scoping, the public expressed concerns regarding the effects on the environment from a potential release of hazardous/toxic chemicals during operations or because of an accident at YTC. The ROI for the management of solid wastes and hazardous materials and wastes includes the Army installation and the areas where the hazardous wastes are disposed. For YTC, this includes the Greater Wenatchee Landfill to the north; Columbia Ridge and Chem-Waste in Arlington, Oregon and Rabanco Landfill in Roosevelt, Washington, to the south; and Terrace Heights and Cheyne Landfills to the east. Wastes for disposal (both nonhazardous and hazardous) are transported off site to permitted disposal facilities. Waste management at YTC is conducted in compliance with all applicable regulations.

5.12.1 Solid Wastes

Refuse generated in Yakima County is hauled by Yakima Waste Systems and disposed at the Yakima County Terrace Heights Landfill. Refuse generated in Kittitas County is hauled by Waste Management of Ellensburg and disposed at Wenatchee Regional Landfill. YTC's waste, disposed of at municipal sanitary landfills, is less than 1 percent of the municipal waste generated in the two counties (Bartz 2009).

Commingled recycle is collected by Yakima Waste Systems. Weight of recycled materials is available for segregated recycle only. During FY 2008, the recycling total was 318 tons (288 metric tons), including more than 102 tons (93 metric tons) of expended brass, over 163 tons (148 metric tons) of scrap steel, nearly 11.5 tons (10.4 metric tons) of cardboard, nearly 8 tons (7 metric tons) of used oil, and more than 7 tons (6 metric tons) of lead-acid batteries. This compared to the FY 2007 total of nearly 645 tons (585 metric tons), including 450 tons (408 metric tons) of asphalt, nearly 28 tons (25 metric tons) of expended brass, nearly 44 tons (40 metric tons) of scrap steel, nearly 8 tons (7 metric tons) of cardboard, and more than 3 tons (3 metric tons) of lead-acid batteries. There were no FY 2007 data for used oil. Without the one-time increase due to asphalt recycling, segregated recycling increased from approximately 195 tons (177 metric tons) in FY 2007 to approximately 318 tons (288 metric tons) in FY 2009 (Bartz 2009).

5.12.2 Hazardous Materials and Wastes

The operations at YTC use hazardous materials and generate hazardous wastes that are similar to those used and generated by Fort Lewis, but in much smaller quantities. Units and activities at YTC typically use hazardous materials such as fuels, paints, solvents, lubricants, coolants, and sanitation chemicals. Hazardous materials also include munitions and UXO, pesticides and herbicides, and POLs and petroleum storage tanks.

Hazardous waste is generated because of facility and equipment maintenance, medical care activities, and Soldier training. Hazardous wastes generated at YTC include biohazardous waste, low-level radioactive waste, asbestos, LBP, and PCBs.

According to the Annual Dangerous Waste Report, YTC generated 4,055 pounds of reportable hazardous waste during 2007 and 8,151 pounds of reportable hazardous waste during 2008 (Bartz 2009). Contract services are used to transport and manage hazardous waste off site.

YTC has two policies and an SPCC Plan in place to help manage hazardous materials and waste. Their purpose is to minimize inventory of hazardous materials, hazardous waste generated, and potential for releases.

5.12.2.1 Ranges, Munitions, and Unexploded Ordnance

YTC's current ammunitions supply point occupies approximately 140 acres located to the southeast of the existing cantonment area and the heliport (Urban Collaborative 2008h). The Ammunition Supply Point contains various munitions in bunkers.

Training exercises and testing activities at YTC expend a variety of ordnance. Ordnance is expended in a variety of direct and indirect weapons, such as grenades, mortars, howitzers, artillery, rockets, and missiles, during training exercises and testing activities. DoD 6055.9 Standard defines UXO as "explosive ordnance that has been primed, fused, armed, or otherwise prepared for action, and that has been fired, dropped, launched, projected, or placed in such a manner as to constituted a hazard to operations, installations, personnel, or material and remains unexploded either by malfunction or design or for any other cause." Grenades, mortars, and artillery weapons used in live-fire training can produce UXO; all other ammunition is inert. Expended ammunition, although inert as an explosive, may remain a source of lead contamination. Soils with lead contamination may be found at gun and artillery practice ranges where lead munitions are used.

Ordnance impact areas and buffer zones are off limits to unauthorized personnel. In addition, impact areas are posted with warning signs indicating the potential risks of UXO on the impact area. Although the majority of UXO is found in designated impact and dud areas, which are well delineated and easily recognizable, UXO is routinely encountered outside these areas on the installation. The EOD unit eliminates explosives hazards on ranges by detonation in place of UXO, or, if safe to do so, by removing the hazard to the EOD range and detonating there.

5.12.2.2 Biohazardous Wastes

YTC does not have a hospital, any medical/dental clinics, or an animal research facility. Therefore, YTC does not generate waste blood products; cultures; and stocks of infectious agents, contaminated bedding material, or pathological waste. However, YTC does have an occupational nurse who generates sharps. Biological wastes associated with Training Units are also generated at YTC.

The Army follows the MEDCOM 40–35 Management of Regulated Medical Waste guidelines for the handing, use, and disposal of biohazardous wastes. All biohazardous waste is managed under the national contract with Stericycle.

5.12.2.3 Pesticides and Herbicides

Pesticides are required for pest control and for the control of unwanted vegetation including noxious weeds. Approximately 400 acres (162 ha) of improved roads and roadsides at YTC were sprayed

under the ground herbicide application contract in 2007 (Durkee 2007). The goal of this herbicide application is to decrease encroachment of noxious weeds into these roads, ranges, and firebreaks.

5.12.2.4 Asbestos, Lead Paint, and Polychlorinated Biphenyls

Buildings constructed prior to 1985 are likely to contain asbestos. In addition, small amounts occur in adhesives, glues, and roofing materials in use after that date. When a building renovation, repair, or demolition project is planned, an asbestos survey is performed to ensure that asbestos-containing materials are identified for proper management. A survey of lead-based paint has not been conducted at YTC; however, it is assumed that buildings built before 1978 contain lead-based paints. Although there are no known PCB transformers at YTC, numerous light fixture ballasts and communications equipment may contain PCBs. As with Fort Lewis, problems associated with these contaminants will be remediated as they are identified and funding is available.

5.12.2.5 Radon and Low-Level Radioactive Waste

All buildings at YTC have been surveyed for radon, and one building was found to contain radon concentrations above the EPA recommended level of 4 picocuries per liter. The high radon building has been mitigated and radon was below the detection limit when resampled and reanalyzed in 2008 (Bartz 2009).

Low-level radioactive waste is generated from commodity items such as unusable compasses, dials, targeting devices, gauges, rocket sights, and chemical weapons detection equipment. Current Army policy prohibits the use of DU ammunition for training worldwide (AR 385–62).

5.12.2.6 POLs and Storage Tanks

POLs are used at YTC including engine fuels (gasoline, diesel and JP8), motor oils and lubricants, as well as diesel and kerosene heating fuels. YTC manages all aboveground storage tanks in conformance with applicable federal, state, and Army regulations. YTC no longer has useable USTs. All previous USTs have been removed, grouted, or filled with gravel. YTC has documentation in place to help manage POLs. This includes the SPCC Plan, which addresses spill prevention and procedures to follow in case of a spill.

5.12.2.7 Hazardous Waste Spills and Contaminated Sites

During the permitting process for the Unserviceable Munitions Treatment Unit (UMTU), a RCRA Facility Assessment was performed in 1995 to identify areas of prior contamination at YTC (Bartz 2009). Currently, eight sites in the cantonment area remain under a Land Use Control Plan. These sites were previously used for activities related to training and maintenance. They were a pesticide handling area, an ammunition storage site burn pit, a fire training pit, two landfills, a vehicle repair shop, an underground storage tank location, and a buried munitions site (Bartz 2009). Controls are primarily administrative, and include actions such as prevention of residential use and restrictions on development of drinking water wells. When existing structures are removed from these sites in the future, additional investigation at three of the sites is expected. Most groundwater monitoring wells were decommissioned in May 2007, although limited groundwater monitoring continues. Groundwater contamination has not been found in YTC or local residential drinking water (Bartz 2009).

5.13 AIRSPACE

As discussed in **Section 3.13**, the FAA is responsible for the control and use of navigable airspace in the U.S. In addition to airspace, the FAA manages the air navigation system, equipment, airports, and the rules and regulations relating to powered flight. The FAA is responsible for managing the

airspace for commercial airliners and air carriers, general aviation, and government agencies including the U.S. military.

The FAA has designated six classes of airspace. Airspace designated as Class A, B, C, D, or E is controlled airspace. Class G airspace is uncontrolled airspace. Within controlled airspace, ATC service is provided to aircraft in accordance with the airspace classification (Class A, B, C, D, or E).

In addition to the classifications above, airspace may also be identified as SUA. Restricted Area is an example of SUA used around military installations. Restricted Areas are defined to exclude non-participating and incompatible aircraft without the permission of the controlling agency. Operations within Restricted Areas would normally include artillery firing, aerial gunnery and bombardment, and high speed and density aerial operations.

YTC has 451 square miles of FAA-designated Restricted Areas. Restricted Areas R–6714 A, B, C, D, and F together essentially cover the complete YTC and normally extend up to 29,000 feet (8,800 m) above MSL, unless a higher altitude is requested. R–6714 G and H separately extend beyond the northern boundary of YTC, G to 29,000 feet (8,800 m) above MSL, and H to 5500 feet (1,700 m) above MSL. R–6714 E essentially overlies all previously mentioned R–6714 areas and runs from 29,000 feet (8,800 m) above MSL to 55,000 feet (16,800 m) above MSL. See Flight Information Publications for exact descriptions of the restricted airspace. It is important to note that just because one part of R–6714 is active, other parts may not be. The installation has access to this airspace and it is controlled by YTC. This airspace is released to the FAA when not needed for military use (Army 2007e).

Two federal airways and one VFR flight corridor occur over or near YTC. Airway V–488 is located directly over YTC and runs generally from southwest to northeast. The floor of this airway is 6,000 feet (1,800 m) above MSL. This airway is unavailable for use when the restricted airspace at YTC is activated. Airway V–I87 runs to the north of YTC and is not affected by YTC airspace. In addition to the lateral boundaries and altitudes for these airways, a 1,000-foot (300-m) vertical buffer is required by the FAA to separate activities on the airways from activities at YTC. The airspace above 1–90 is used extensively as a flight corridor for aircraft flying under VFR conditions. Use of this corridor is not affected by YTC activities.

All services, including Army, Navy, and Air Force, train with helicopters and fixed-wing aircraft at YTC. Helicopter missions are typically flown at or below 300 feet (91 m) above ground level. Fixed-wing aircraft missions are typically flown at or above 500 feet (152 m), although they may go below 500 feet (152 m) for certain activities. Routes, altitudes, entry points, and egress points for jet aircraft participating in training exercises at YTC are established to minimize noise impacts, avoid population centers, and avoid conflicts with other nearby airspace uses. All aviation activities and airspace use at YTC are conducted in compliance with FAA regulations.

The airfield at YTC is VAH. It is located near the lower boundary of the cantonment area and is used solely for helicopters. It consists of a single runway (5/23) oriented on a northeast/southwest axis and associated taxiways, and ramp space to support military aircraft operations. The runway is 50 feet (15 m) wide and 1,600 feet (490 m) long.

As noted earlier, only rotary-winged aircraft use VAH — fixed-wing aircraft are not authorized. The existing runway is used as a hover lane for all approaches and departures. All repair and maintenance are conducted in such manner to accommodate rotary-winged aircraft. The runway, taxi, and parking areas are maintained and repaired to protect rotary-winged aircraft from foreign object damage.

Currently, approximately 2,600 landings and takeoffs occur at VAH annually (Clayton 2009a). The U.S. Army Air Ambulance Detachment (USAAAD) accounts for a portion of these landings and takeoffs. The USAAAD trains with seven medevac helicopters at VAH.

When flying between YTC and Fort Lewis, the helicopters are not restricted to any specific corridor. The weather usually determines the route they fly (Clayton 2009b). The most direct routes require more altitude, so a lower cloud base may obscure some or all of the terrain on a particular route. Such low-base conditions may force the pilots to follow a pass route or even go down to Portland and go through the Columbia River Gorge.

In addition to VAH, YTC has an airstrip out in the training areas. Selah Airstrip is approximately 4,600 feet long and 75 feet wide, plus overruns and associated parking areas. This strip is used by UASs and helicopters. UASs include unmanned aerial vehicles such as the Predator and Raven.

Yakima Air Terminal/McAllister Field is about seven nautical miles southwest of VAH. The airfield consists of two runways. The primary runway (9/27) is oriented on a west/east axis and is 150 feet (46 m) wide by 7,604 feet (2,318 m) long. Runway 4/22 is oriented northeast/southwest and is 150 feet (46 m) wide by 3,835 feet (1,169 m) long. The Yakima Air Terminal/McAllister Field receives commercial flights and the aircraft control tower has VFR and IFR capability 24 hours a day (Army 1994). Approximately 160 aircraft, which include both fixed- and rotary-winged aircraft, are based on the field.

5.14 FACILITIES

Army real property (facilities) includes land, facilities, and infrastructure. Land includes Army-owned lands (real estate), leaseholds, and other interests in land. Facilities include buildings, structures, and other improvements and appurtenances to support the Army's mission, such as cantonment areas and training ranges. Infrastructure is the combination of supporting systems that enable the use of Army land and resident facilities, primarily utility infrastructure. Utility infrastructure includes electrical, gas, water, wastewater, storm water, and communications.

Roadways and other ground transportation infrastructure serving YTC are described in **Section 5.10**, Traffic and Transportation. Energy infrastructure is addressed in **Section 5.15**, Energy Demand/Generation.

The following resources also guide facilities management at YTC:

- Fort Lewis Regulation 200–1, Environmental Quality: Environmental Protection and Enhancement
- Fort Lewis Regulation 350–2, Training Support
- Fort Lewis Regulation 350–31, Yakima Training Center Range Regulations
- AR 200–1, Environmental Protection and Enhancement
- AR 210–20, Installations: Real Property Master Planning for Army Installations
- AR 350–19, Training: The Army Sustainable Range Program
- AR 420–1, Facilities Engineering: Army Facilities Management
- 43 USC 1701, et seq., as amended, Federal Land Policy and Management Act (Public Law 94–579, 1976)
- TC 25–1, Training Land
- TC 25–8, Training Ranges

As discussed in **Section 3.9**, planners divided Fort Lewis and YTC into geographically distinct districts and then created ADPs to address the unique mission and facility requirements for each geographic area on Fort Lewis and YTC. In the case of YTC, a single ADP has been developed, which focuses primarily on the cantonment area.

5.14.1 Real Estate

YTC is approximately 25 miles by 21 miles, with a total acreage of 327,200 acres (Urban Collaborative 2008h). The cantonment area within YTC includes approximately 1,700 acres and the remainder of YTC is composed of training areas. Of the total training area acreage, the CIA encompasses approximately 17,700 acres. The developed portion of YTC is very small and is surrounded by enormous tracts of undeveloped land.

5.14.2 Buildings and Structures

Most facilities at YTC are located in the cantonment area; however, some facilities are located in the training areas. Those within the 1,700-acre (690-ha) cantonment area are located in the southwest corner of the installation (Army 2005c). VAH, located in the cantonment area, is used for rotary-wing aircraft.

5.14.2.1 Cantonment Area

There are no Family housing facilities or schools on YTC. There are 77 permanent structures within the cantonment area (Army 1999). Barracks, which house up to 2,500 people, are utilized on a temporary basis by military personnel who are participating in training exercises on YTC (Army 2005c). Personnel assigned to YTC and their dependents live off the installation, within the regional area.

A small developed area is located on the west side of the installation and contains the parade field, headquarters, and other support facilities for the permanent party members of the installation.

The YTC ADP outlines the planned and programmed development for the YTC cantonment area and provides proposed site locations for headquarters, barracks, and maintenance facilities that are required to replace the existing Korean War era facilities. A number of old temporary buildings (meant to be in place less than five years) continue to be used at YTC; however, some of these buildings have greatly exceeded their useful life. These facilities require additional maintenance are energy-inefficient, and need to be demolished and replaced. The majority of the facilities on YTC will be replaced within 25 years (Urban Collaborative 2008h).

5.14.2.2 Training Areas

YTC provides facilities for military training and includes training lands, range complexes, and support facilities. Although designed for Army use, the CIA and MPRC are approved for use for conventional and tactical weapons deliveries. There are currently 26 developed ranges at YTC (Pacific Northwest National Laboratory 2006). The training facilities at YTC support a wide range of gunnery and maneuver training and include maneuver corridors, impact areas, ranges, drop zones, and bivouac areas. Training exercises at YTC include dismounted (on foot), motorized, mechanized, and armored infantry maneuvers at the platoon, company, battalion, and brigade levels. Live-fire gunnery training is also conducted, including large caliber tank, Bradley fighting vehicle, and anti-tank missile firing, as well as indirect mortar and howitzer gunnery. The Selah airstrip located in Training Area 12 provides tactical assault capabilities (Army 2004b). Training includes individual and crew gunnery, small arms qualification, engineer and communications training, and collective (unit) maneuver and live-fire training. YTC is also used for air assaults, air drops (personnel and equipment), and special operations gunnery and maneuver. Availability of MPRC, artillery firing points adjacent to ground maneuver corridors, the MPTR, and other ranges provide opportunities for multiple live-fire training iterations.

To aid in resource management, YTC is divided into five zones as described in **Section 5.9**. The zone designations identify allowable military training activities and acceptable levels of impact to the resources to maximize military training opportunities, while simultaneously safeguarding resources. Most forms of training are prohibited in Zone 1 because this zone is managed for significant and sensitive natural or cultural resources. Although Zone 2 is managed as a Sage-grouse Protection Area, most forms for training are allowed, with the exceptions of digging and bivouacking activities. Zone 3 comprises approximately 75 percent of YTC. The MPRC, MPTR, and all the primary training and vehicle maneuver areas are located within Zone 3. Zone 4 accommodates heavy use and high-impact activities, such as BSAs and gravel pits. Zone 5 includes impact and dud areas and the Selah Airstrip.

Degradation of the training areas may reduce the types, quality, and quantity of training activities that YTC can support. Environmental management at YTC helps to minimize degradation of the training areas. The ITAM Program is the Army's approach to management and maintenance of Army training lands. ITAM funds are provided to support monitoring, maintenance, and rehabilitation of natural resources affected by training activities and to maintain military access to training lands. ITAM projects support a sustainable resource for military training and environmental stewardship (Durkee 2007).

The only programmed downrange facility is the DMPRC. There are a number of additional projects on YTC to be completed by outside sources funded through the Strategic Environmental Research and Development Program. These projects include development of an erosion model and decision process, noxious weed control, and plant materials development.

5.14.3 Infrastructure

5.14.3.1 Water Supply

The drinking water supply for YTC is provided entirely from groundwater sources. Six wells provide water for three permitted drinking water distribution systems located in the cantonment area and at YRS and the MPRC. Prior to distribution and use, this water is treated as needed at the wellhead by chlorination. The remaining wells are located throughout the training area (Bartz 2009).

Water for the permitted drinking water distribution system in the cantonment area is supplied by three wells and stored in two tanks with a combined storage capacity of 1,130,000 gallons (4.3 million L). At YRS, there are two wells with a combined storage capacity of 375,000 gallons (1.4 million L). MPRC has one well with a storage capacity of 1,200 gallons (4,500 L). The remaining eight wells located within the range areas have a combined storage capacity of 415,300 gallons (1.6 million L) (Bartz 2009).

Water used during training exercises may be drawn from the cantonment area system and hauled to the field or drawn directly from one of the training area wells. Summer demand for water at YTC averages approximately 200,000 gpd (760,000 L per day). Approximately three quarters of this water comes from the cantonment area system.

Non-potable water for fire suppression is currently obtained from both ground and surface water sources. Potable water from developed wells is also available for use. There are currently 24 fast-fill wells, three spring-fed fast fill wells, two fast-fill tanks (which are kept filled through water delivery by the YTC Fire Department), and six ponds throughout YTC for use in fire suppression activities. Surface water from Columbia River represents one of the primary sources of water for the aerial

firefighting. In addition, YTC is in the process of drilling a new well that can be used for wildfire management (McDonald 2009c).

5.14.3.2 Wastewater Treatment Systems

YTC has a permitted wastewater treatment plant, which is located outside the installation boundary between the cantonment area and the Yakima River. The plant provides primary and secondary treatment of primarily domestic wastewater before discharge of effluent into the Yakima River. Only a portion of the permitted treatment capacity of 720,000 gpd (2.7 million L per day) is currently utilized. Peak daily flow is estimated at approximately 150,000 gpd (570,000 L per day) (Bartz 2009).

Several of the smaller, remote structures within the cantonment area are self-contained, with individual septic tanks and drain fields. All wastewater outside the cantonment area is treated with the use of septic tanks and drain fields or lagoons. Self-contained field latrines are used to support training activities.

5.14.3.3 Stormwater Management

Stormwater drainage at YTC is generally through natural settings, such as interim creeks and valleys. Natural drainage is enhanced by curbing, parking lots, and ditches.

The stormwater drainage system serving the cantonment area at YTC consists of three detention basins, several oil/water separators, and open ditches (Army 2004b). The drainage system discharges into an intermittent stream that then enters the Yakima River downstream of Selah Creek. Because of the low hydraulic gradient of vegetated channels of the drainage systems and long distances to receiving waters, storm drainage has not historically resulted in adverse effects on the Yakima River (Army 2004b).

Prior to construction activities, a SWPPP must be developed and implemented. The SWPPP must comply with the federal National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit requirements and include appropriate BMPs (Army 2007e).

5.14.3.4 Telecommunications

The YTC telephone system is operated and maintained by the Directorate of Information Management, located at Fort Lewis. QWEST provides outside telephone service to the YTC switch. Communications facilities at YTC are also divided into two major areas: the cantonment area, with 4 miles (6 km) of aerial cable and 12 miles (19 km) of underground cable; and the training areas, with approximately 63,360 feet (19 km) of aerial cable and more than 480 miles (772 km) of underground cable (Cumpston 2009).

5.15 ENERGY DEMAND/GENERATION

The ROI for energy demand and infrastructure is defined as the service area for the Kittitas Public Utility District and the local service areas for PacifiCorp (electric provider for the cantonment area) and the Cascade Natural Gas Corporation.

5.15.1 Electricity

PacifiCorp is the primary supplier of electric power to YTC. The Kittitas Public Utility District provides electric power for the MPRC and the Doris site. The total annual electricity consumption for YTC in FY 2008 was 12,351,023 kilowatt hours (McDonald 2009f).

5.15.2 Natural Gas and Fuel Oil

Cascade Natural Gas Corporation supplies natural gas to YTC. Natural gas is the primary source of heating energy. Diesel and propane are also used for heating.

During FY 2008, natural gas consumption at YTC totaled 421,155 million British thermal units (McDonald 2009f). In addition, 11,300 gallons (42,800 L) of propane were used as backup sources of fuel (McDonald 2009f).

Heat energy is currently being updated in the cantonment area at YTC. The conversions consist of individual natural gas forced air systems that replace steam heat service from boiler plant sources (Army 2007e). The programmed new facilities will replace deteriorating facilities, resulting in anticipated energy savings. The Army would construct all new facilities to achieve a minimum of the Silver level in the LEED ratings system, which includes national standards for high-performance buildings that result in water savings and energy efficiency.

5.15.3 Steam

Steam facilities have been decommissioned and replaced by natural gas units in each building. From mid-2009 forward, steam will no longer be used at YTC.